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VALID INCENTIVES
by E. C. GORDON ENGLAND, F.R.Ae.S., M.I.E.E., M.I.Prod.E., F.I.I.A.

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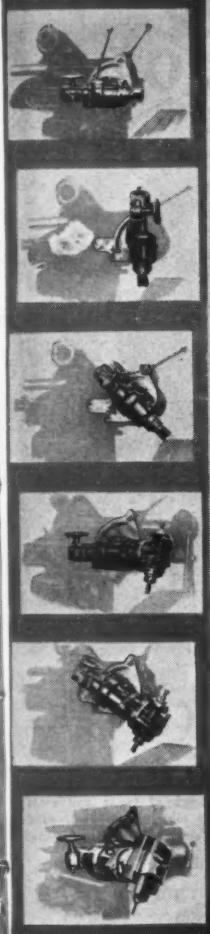

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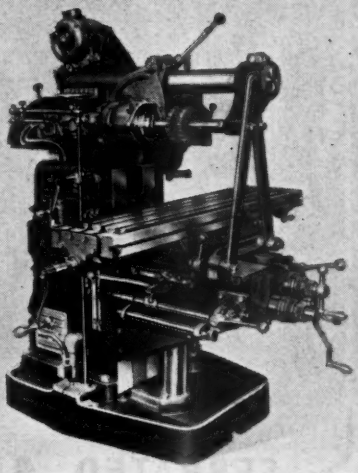

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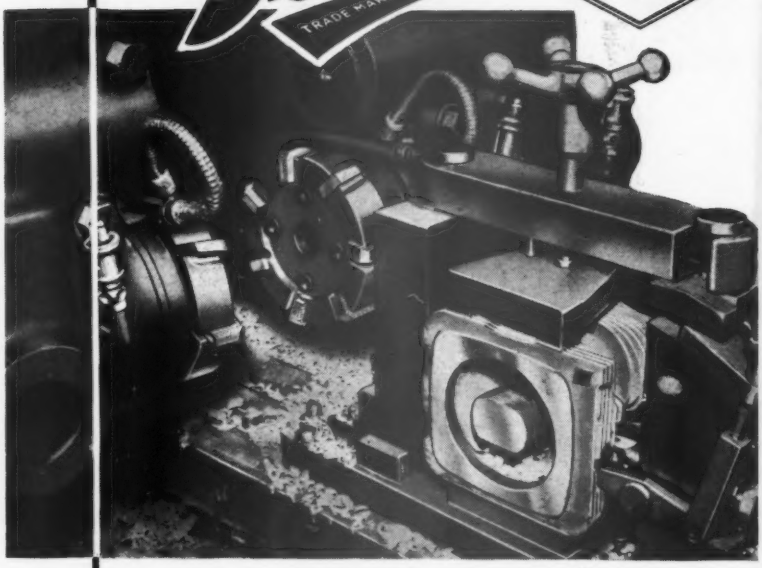

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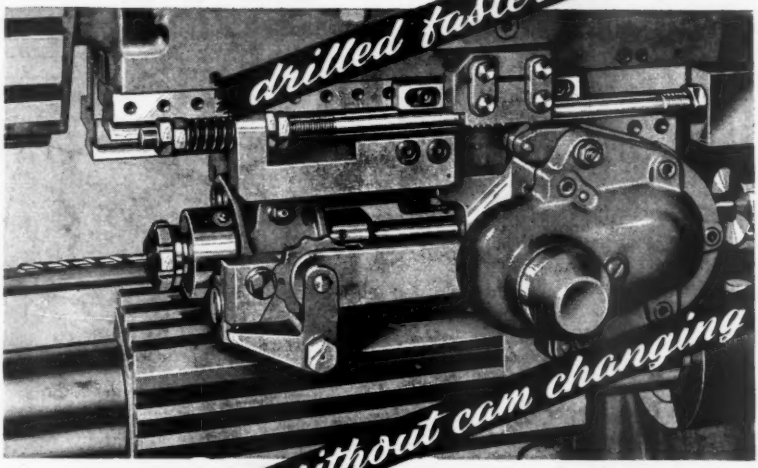

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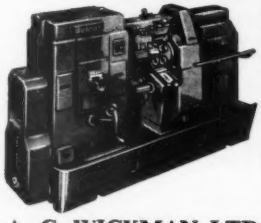

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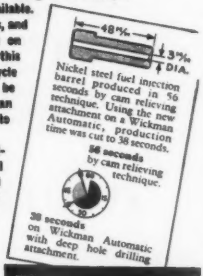
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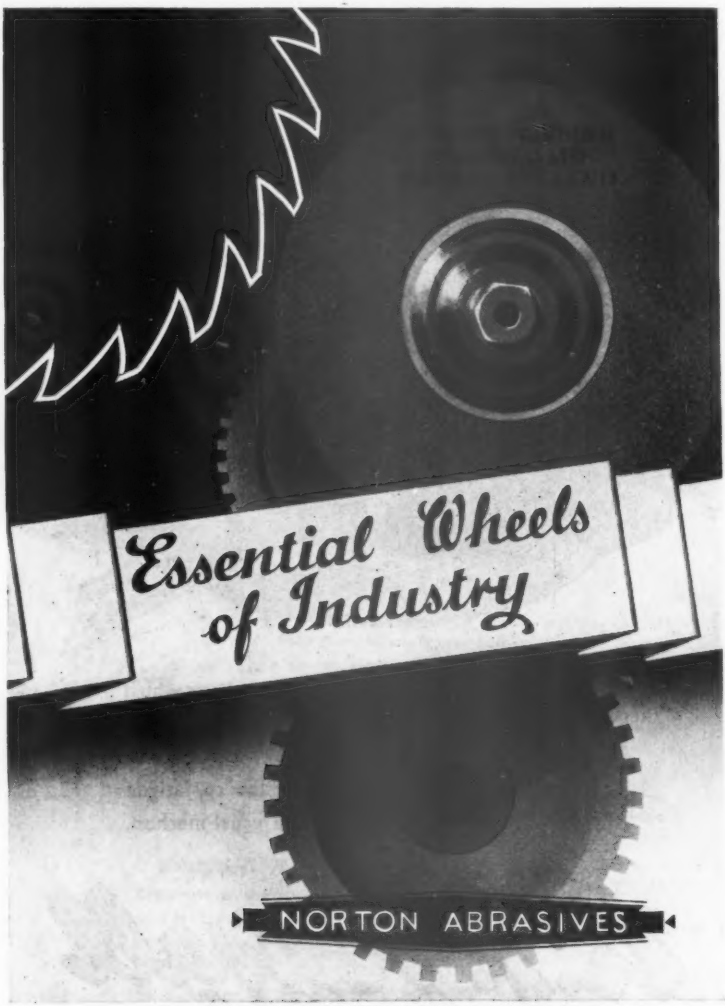

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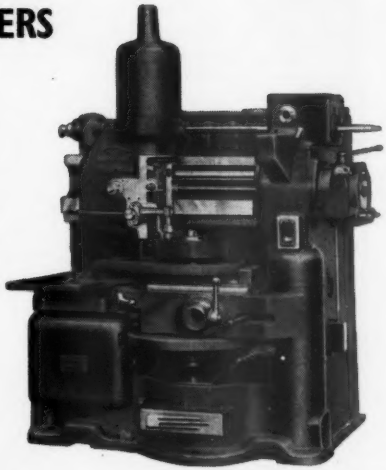

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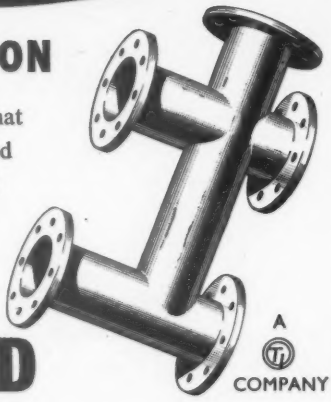

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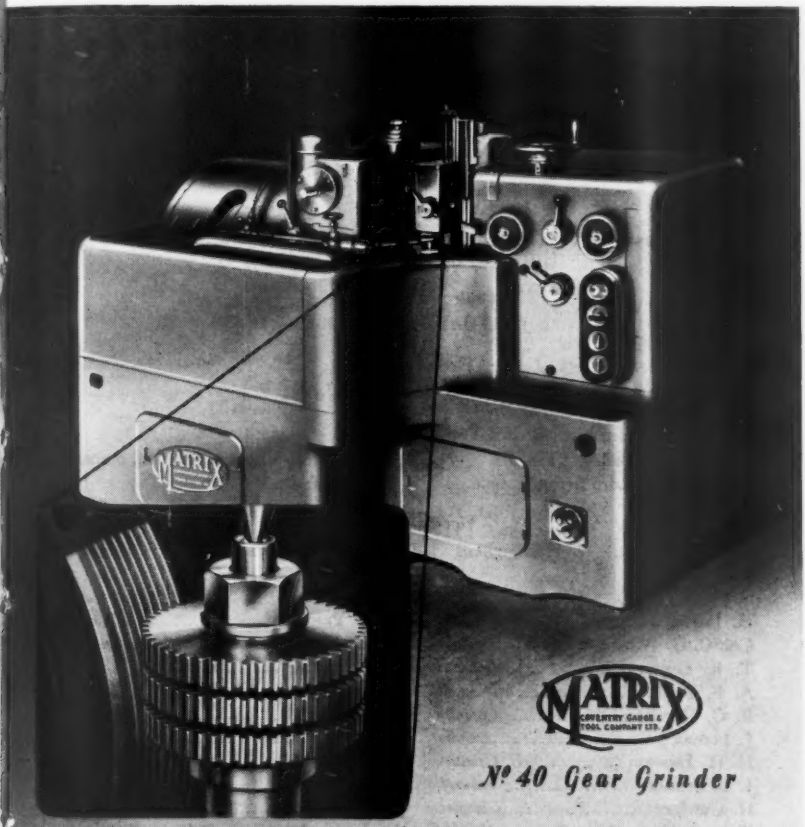

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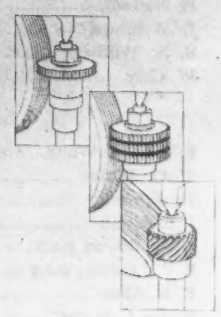

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SCHOFIELD TRAVEL SCHOLARSHIP AWARDS

An outstanding event in the history of the Institution was the decision to award Travel Scholarships to the two outstanding Graduates in the Institution.

It was decided that these Travel Scholarships would be an annual competition, with the object of offering a valuable prize to promote interest and develop the type of Production Engineer so valuable to British industry and national prosperity. It was this objective which was visualised by Mr. E. W. Hancock, M.B.E., Vice-President of the Institution, when he proposed, on his return from a visit to the United States in 1946, that such a scheme should be considered.

In view of the prominent part played by the Institution's President, Dr. H. Schofield, C.B.E., in the educational field, the Institution decided to honour this project with his name.

TERMS OF REFERENCE The first problem after the decision had been taken and the funds reserved, was of course to select Production Engineers with qualifications worthy of the prize. This was a problem similar to that faced by industry, particularly in the selection of individuals who would uphold the high purpose of the Institution's definition of a Production Engineer :—

> " A Production Engineer is one who is competent by reason of education, training and experience in technology and management to determine the factors involved in the manufacture of commodities, and to direct the productive processes to achieve the most efficient co-ordination of effort, with due respect to quantity, quality and cost."

The terms of reference of the Institution's Education Committee were to recommend to Council two Graduates who, by competitive selection, would qualify for a six months' Travel Scholarship in the United States. The purpose of their visit would be the study of production processes, techniques and management, with a view to improving their knowledge and experience, so that they could implement this within their own organisations, and disseminate such knowledge to the members of the Institution of Production Engineers.

FORMATION OF SCHOLARSHIP SUB-COMMITTEE The Education Committee decided to set up a Sub-Committee of five persons to cover the whole project of competitive assessment, selection, financial arrangements, publicity, travel, placing in the United States, and final dissemination of the experience gained, on returning to England.

The following members constituted this Sub-Committee :—

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Prof. T. U. Matthew (Professor of Engineering Production, Birmingham University).

Secretary: Capt. G. E. Knight, (Head of Education Dept., I.Prod.E.)

At their first meeting the Sub-Committee acknowledged that here the Institution had a considerable prize to offer, and that every opportunity should be taken to utilise this to the fullest extent. With this in mind, certain objectives were decided upon :

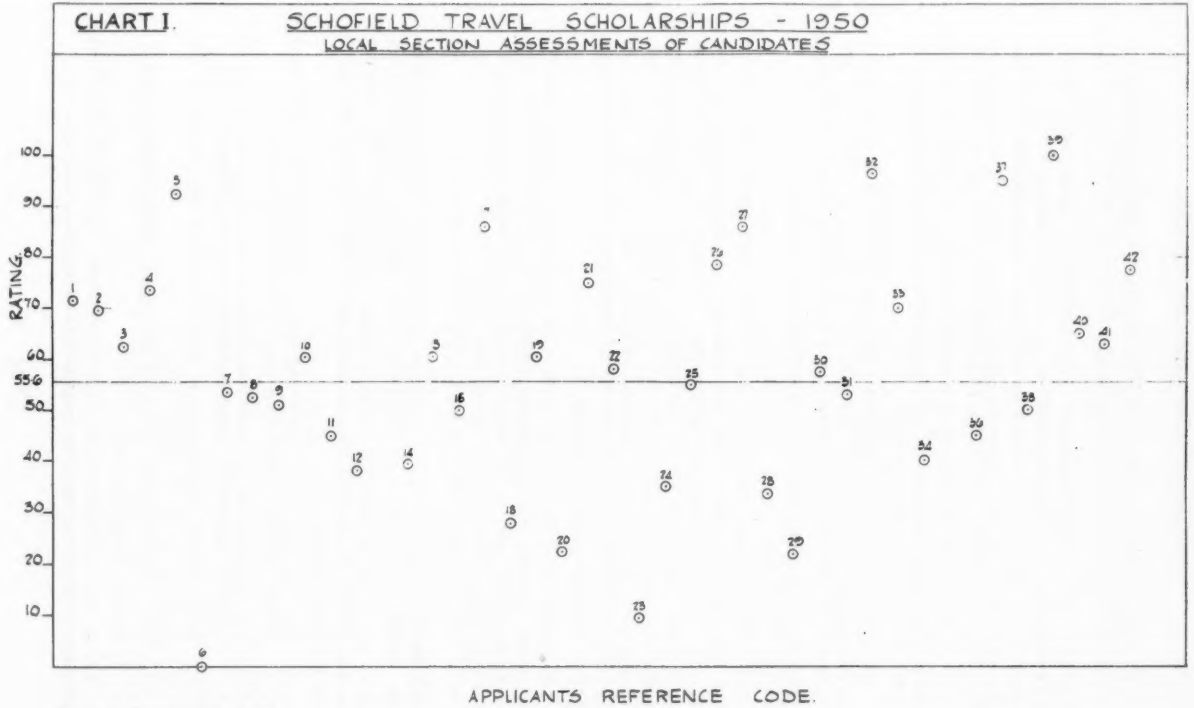
(1) *Promoting Initiative.*—Realising that one of the dominant characteristics in bringing a young Graduate to the surface for promotion was that of individual initiative, it was agreed that application to enter the competition must be by the individual, who first had to convince his employer of his qualifications and intentions.

(2) *Institution Graduate and Employer Interest.*—In order to cultivate the employer's interest in his young Production Engineers identifying themselves with a professional Institution, one of the methods of selection was the completion by the employer of an assessment form in regard to the applicant's technical ability, leadership, his attitude toward the job, and the previous work he had done on the subject to be studied.

(3) *Institution Graduate and Technical Colleges.*—With the object of drawing the attention of technical colleges to the advantages offered by the Institution, and to focus interest on their individual students, an assessment form was required to be completed by the applicant's technical college, bringing forward his academic ability, his attitude toward his studies, and his general character as evidenced by college life.

(4) *Promoting Interest in Local Sections.*—With a view to allying local industrialists, technical colleges, and the Graduate himself to the local Section of the Institution, and also with the object of propagating interest in the local Section, Sub-Committees of the local Sections were required to assess the reports of the employer and the technical college, and by personal interview to report on the local applicant's Institutional activities, his appearance and presence, his characteristics, logic and power of expression.

(5) *Publicity.*—To publicise the activities of the Institution, not only to its members, but to industry and technical colleges—the initial announcement of the launching of the Travel Scholarship to



Average Assessment: 55.6

be by information published in the Institution's Journal and technical press, and by posters sent to affiliated firms and technical colleges.

SCHEME IN OPERATION Approximately 100 Graduates made application originally, and the fact that of these 42 were of the required standard to proceed to the next stage indicated that the first objective of promoting individual initiative and self-examination had been realised. The Sub-Committee's next step in selection was to review the qualities of these 42 students in order to assess those who would qualify for the next stage. With this in view, the following charts were compiled :—

Chart I.—A graph was plotted to indicate the level of each of the 42 candidates as assessed by the local Sections. The average assessment line was drawn at the 55/6 level, below which candidates were not considered to be of the required standard to be able to proceed further.

Chart II.—A summary was made of the assessment forms under the various headings. From this summary it was evident, in view of the figure appearing under the heading of " Institutional Activities " on Form 3 (Section), that a number of Graduates had failed to take advantage of the opportunities afforded by the Institution for visits to British industry, and in fact had not acquainted themselves with the best current practice in this country before seeking to travel abroad.

Resulting from the review of these 42 candidates, 26 were invited to write a paper on a particular production subject in which they were qualified, and at the same time to put forward their proposals for furthering their knowledge in this subject in the United States, should they be successful under the Scholarship Scheme.

ASSESSMENT OF PAPERS All 26 of the Graduates submitted the necessary paper and the high standard of the majority of these papers gave the Sub-Committee considerable satisfaction. The papers were assessed by each of the members of the Sub-Committee under these classifications :—

(1) The quality of the covering letter, including the statement setting out the reasons for the choice of the project.

(2) The analysis of the problem involved, including the technical content and background knowledge of the subject.

(3) The method of approach to be used in the study of the problem in the United States.

(4) The style of presentation of the paper, including exposition, layout, diagrams, etc.

From this assessment the Sub-Committee selected a short list consisting of the seven best qualified Graduates.

Chart III.—This may be of interest at this stage, and although it is only representative of the 13 best papers, it does indicate that the ability to write a letter as against that of writing a report or paper is much less well developed in our Graduates.

It is also significant that while the analysis and subject matter were invariably good, the style of presentation could be improved.

CHART II

SCHOFIELD TRAVEL SCHOLARSHIPS, 1950

Form 1 (*Employer*)

Technical Ability	Ability as a Leader	Attitude towards Job	Previous work in the subject to be studied
Above average : 80½%	58½%	80½%	83%
Average : 14½%	24½%	14½%	14½%
Below average : 5%	17%	5%	2½%

Form 2 (*Educational*)

Academic Ability	Attitude towards Study	General character as evidenced by college life
Above average : 73%	83%	80½%
Average : 10%	12%	9½%
Below average : 17%	5%	10%

Form 3 (*Section*)

Institutional Activities	Appearance & Presence	Charac-teristics	Logic and Power of Expression
Above average : 29¼%	56%	58½%	51¼%
Average : 24½%	29%	12%	46¼%
Below average : 46¼%	15%	19½%	2½%

CHART III

SCHOFIELD TRAVEL SCHOLARSHIP
Assessment of Projects

Applicant's Reference Code	Letter A-10	Analysis B-30	Method C-30	Style D-30	Total	Remarks
1. (LI)	4	15	15	10	44	
3. (LE)	6	25	25	15	71	
5. (YO)	4	15	15	10	44	
9. (BI)	4	10	15	15	44	
17. (MA)	6	20	15	10	51	
22. (LE)	6	20	15	20	61	
26. (CO)	10	30	30	25	95	
27. (LO)	8	30	25	25	88	
33. (LE)	6	20	20	20	66	
32. (WO)	6	15	20	15	56	
37. (BI)	8	25	30	25	88	
40. (LO)	8	30	25	30	93	
42. (SH)	6	15	15	15	51	

SELECTION INTERVIEW With the object, for the final selection, of assessing the applicant's capabilities, initiative, personality, power of explanation and debate, and reaction to situations, and at the same time his ability to mix with and converse with others, an intensive selection interview was arranged as follows :—

(1) INTRODUCTIONS

The seven finalists were invited to meet the members of the Selection Committee in London, and after being suitably introduced to one another and presented to the members of the Selection

Panel, they had the programme of interview explained to them. They were then invited to assist the Selection Panel in selecting the two applicants amongst them whom they considered should be awarded the Travel Scholarships.

They were first given the opportunity to introduce themselves by giving in the course of about ten minutes a biography of their experiences to date.

It was significant at this stage to note that six of the seven men had come through technical colleges, and in fact four of them were students of Loughborough College.

(2) DISCUSSION

The next stage was to have dinner with the Selection Panel, and around the table and after dinner the candidates were given two subjects to discuss :—

(a) "*The Place of the Industrial Consultant.*" By putting themselves in a position of a Works Manager, they were to consider the position and present the case for engaging an Industrial Consultant to investigate and advise on some aspect of their organisation.

The advisability of such a step obviously had to be considered, together with the way in which they would introduce it into the organisation, and their final expectations.

After discussing this for a matter of three-quarters of an hour a second subject for discussion was put forward :—

(b) "*Equal Pay for Equal Work.*" Here the finalists had to discuss the merits or otherwise of such a decision, its reaction on the factory floor, the case that would be presented to the Shop Stewards, Unions, etc.

These discussions certainly gave ample scope to enable the Selection Committee to assess the qualities already mentioned.

The finalists were accommodated in a London hotel for a continuation of the interview on the following day.

SELECTION IMPRESSIONS The Panel immediately set about recording their impressions, and it was interesting to note that all were unanimous on the No. 1 candidate, but there were varying opinions on the relative positions of the remainder.

On the morning of the next day each candidate was given an individual interview lasting some forty minutes, when he was questioned by each member of the Selection Panel with the object of bringing out in greater detail :—

(*a*) The depth of his academic career.

(*b*) The span of his technical attainments and qualifications in the project to be studied.

(*c*) His interests and hobbies in the arts, sport, recreation, etc.

(*d*) His character, family life and ambitions.

At the end of the interview each man was reminded of the fact that only two were to be chosen of seven, and in all probability he might be one of the five unsuccessful candidates. The Selection Panel intimated to the candidates that they would be interested to know just what they had thought of the method of selection, and whether they considered they had been given every opportunity to put forward their best ; if they considered they had had an opportunity to express themselves ; and in fact if they were unsuccessful, if they were still satisfied that they had had a fair opportunity.

It was interesting to note that with one exception, all were in high praise of the method of selection, and the opportunity afforded them to express their views, and the comment was made : " If only we could feel when we applied for a job that we would be given the same facilities, there would be no complaints of a lack of opportunity within industry."

FINAL ASSESSMENT After this final interview the Panel set about the task of the final assessment, and it was interesting to note that the first selection of the previous evening was even further amplified by the final selection. In selecting No. 2, however, some considerable difficulty was encountered, and the Committee only wished there had been three Scholarships to offer.

THE SUCCESSFUL CANDIDATES The background of the successful candidates is as follows :—

MR. B. E. STOKES, BIRMINGHAM.

Mr. Stokes, who will be 28 next month, was educated at the Edward Shelley Secondary School, Walsall, the Walsall Technical College, and the County Technical College, Wednesbury. He obtained the Ordinary National Certificates in Mechanical and Electrical Engineering, with Structural Engineering endorsements.

Mr. B. E. Stokes

He was awarded a National Certificate Prize and the John Thomson Prize for the year's outstanding set of Higher National Certificate papers, and subsequently received the Woden Works Prize for the best Industrial Administration paper of the year at the County Technical College, Wednesbury.

Mr. Stokes served a five-year apprenticeship with the Wellman Smith Owen Engineering Corporation, Ltd., of Darlaston, and was then employed in the drawing office of the firm until he volunteered for the Army in 1943. He was granted a commission in R.E.M.E., and spent most of his service in the Middle East, being released in 1947 with the rank of major.

In the same year he joined the staff of Joseph Lucas, Ltd., Birmingham, and is now assistant to the General Factory Manager of the Birmingham Group of Factories, and Deputy Production Control Manager of the Great King Street Factory.

He is a member of the Birmingham Graduate Section Committee, and recently delivered a paper on some aspects of production control.

The project which Mr. Stokes proposes to study in the United States is the organisation of production administration for increased productivity, with special reference to the use of production control.

MR. W. N. ASPINALL, RUGBY.

Mr. Aspinall, who is 26 years of age, attended the Boys Grammar School at Leigh, obtaining the Northern Universities School Certificate. He then studied for the Higher School Certificate until 1940, when he was awarded a free Studentship and later a State Bursary at the Wigan and District Mining and Technical College. He obtained an external B.Sc.(Eng.) of London University with first class honours in July, 1943, and remained at the college for a further year as a member of the teaching staff.

In July, 1944, Mr. Aspinall commenced a two-year apprenticeship with the English Electric Company at their Stafford works. As a result of experience gained in research and experimental work during this period, he was subsequently appointed a technical assistant in the Fabrication Department.

Mr. W. N. Aspinall

In January, 1948, he became assistant foreman in the Fabricating Shop of the Rugby Works of the English Electric Company, and for the past four months has been in charge of the night shift. In this appointment he has had an opportunity of obtaining additional experience of the mechanical aspect of generating plant, steam turbine and condensing plant, oil engine and water turbine equipment, and has also become acquainted with problems of shop floor administration and the handling of labour.

Mr. Aspinall's project for study in America is the application of welding to the construction of large structural components, with particular reference to reduction of cost by control of distortion and pre-machining of details.

CANDIDATE RESUMÉ While the credit for climbing the hard way is not always given to young people today, it is significant that in the case of the two successful men they have chosen a career demanding a considerable amount of grit and energy, and unlimited time and attention.

In regard to Mr. Stokes, it was interesting to see that by applying the same qualities in the Forces as he did in industry, he soon rose to a position of note, and turned what might have been an unprofitable period into one of value.

When he was released from the Army, he decided on a production career because he felt from his experience that here was the opportunity to expand himself and rise to the highest level. He did in fact offer his services to a number of companies at a nominal salary for three months in order to prove his abilities.

In the case of Mr. Aspinall, he had the initiative to accept the hard way to promotion, even though he had the responsibility of supporting his widowed mother. With the qualifications of a First Class Honours degree, he was prepared to accept the job of Junior Nightshift Foreman to put his qualifications to the practical test.

Yet again, the third man, who although he had the advantage of a higher social sphere in which he could enjoy considerable comfort in a home life, and financial security, preferred to fight his way away from home. In fact, on being refused the opportunity to enter the competition by his employer, he decided after the third request, to leave his job, and risk and seek further employment in his determination.

The Committee feel that the calibre of the young Production Engineer now entering the membership of the Institution can be regarded with some gratification, and the knowledge that such men are coming forward to lead British industry is a source of great satisfaction.

PLACING OF STUDENTS IN AMERICA

One further aspect of the work dealt with by the Sub-Committee was that of placing the students in suitable firms in America. This was complicated by the fact that it was not known from which type of industry the successful candidates would come, and in order to cover eventualities a series of contacts had to be made in the States.

The impression is sometimes given that things are so different and so much easier in the States than in Britain, and that the American industry is always the "open door." It is worthy of note, however, that while over twenty separate approaches were made to individual companies in the States (very often with the advantage of personal introductory contacts) in the majority of cases a negative reply was received, in which it was indicated that while the Scheme had their full commendation, unfortunately due to the low employment rate, etc., in American industry at the present time, they were unable to participate.

On the other hand, of course, there were a few very willing and helpful industrial friends who came forward to offer the necessary facilities.

ADDITIONAL ITEMS OF INTEREST

(1) It is understood that the American representatives of the Anglo-American Committee on Productivity have already suggested to their British counterparts that they would be interested in placing a number of selected young men from British industry on a course of production experience in American industry.

(2) The E.C.A., with whom contact had to be made in order to secure the dollar allocation for the scheme, were considerably impressed with the technique adopted by the Institution for the selection of these candidates, and they intend to use this as a pattern in their national assessments.

(3) In order to complete the circle of the Sub-Committee's objectives, it was decided to present a certificate of achievement to the two successful men.

(4) Apart from the letter addressed to the successful applicants and their employers by Dr. Schofield, letters were also sent by the Chairman of the Sub-Committee to the five other men who ranked with them in the selection of the seven best Graduates, and also to their employers, giving credit for their performance.

B. H. DYSON,
Chairman,
Scholarship Sub-Committee.

INSTITUTION NOTES

March, 1950

MEETING OF COUNCIL The next Meeting of Council will be held on Thursday, 27th April, 1950, at 11 a.m., at 36, Portman Square, London, W.1.

DOLLAR EXPORTS BOARD The Institution has been advised by Sir Cecil Weir, K.B.E., M.C., D.L., Chairman of the Dollar Exports Board, that he would be grateful for any assistance from members of the Institution visiting the United States.

If any members make observations which could usefully be applied, they will no doubt pass their comments to the Board.

ENGINEERING EDUCATION IN LONDON & HOME COUNTIES The Regional Advisory Council for Higher Technological Education in London and the Home Counties has prepared a report giving a general indication of the facilities for engineering education in technical institutes and colleges, and university colleges in London and the Home Counties. It is thought that this document may be of some help to those in industry whose duties include the giving of advice to young employees on the type of further education they can most profitably pursue.

Application for copies of the document should be sent to The Secretary, Regional Advisory Council, 20, Fitzroy Square, W.1.

EXERCISE "OUTPUT" On the 12th, 13th, 14th and 15th January, 1950, a production exercise was held at Aldershot for officers of the Royal Electrical and Mechanical Engineers in the Southern Command. This exercise, which was the first of its kind to be held by the Army, was the result of close co-operation between the R.E.M.E. authorities and the Institution of Production Engineers, who assisted by making arrangements for a number of industrial executives to give lectures.

The lecture programme was as follows :—

"Fundamentals of Industrial Administration," by Mr. G. Norton, M.I.I.A. (Urwick, Orr & Partners).

"Factory Organisation in Industry," by Mr. A. Collis Jones, M.A. (Urwick, Orr & Partners).

(Lt. Col. L. Urwick, O.B.E., M.C., C.I.Mech.E., M.I.Prod.E., also attended and gave an address during the discussion which followed these papers)

"Shop Organisation and Layout," by Mr. C. R. Whitaker, M.I.Prod.E. (E.M.I.Ltd.).

"Production Planning," by Mr. J. W. Buckley, M.I.Prod.E. (George Kent, Ltd.).

"Production Control," by Mr. G. E. Still, M.I.Mech.E., F.I.I.A. (A.E.C.Ltd.).

"Work Measurement and Incentives," by Mr. Winston Rodgers, B.Sc., M.I.I.A. (Acton Technical College).

"Job Evaluation and Merit Rating," by Prof. T. U. Matthew, Ph.D., M.Sc., M.I.Prod.E. (Birmingham University).

"Industrial Relations," by Mr. W. J. Clarkson (Glacier Metal Co. Ltd.).

"Administrative Control," by Mr. T. G. Rose, M.I.Mech.E., M.I.Prod.E., F.I.I.A. (Industrial Consultant).

Some hundred senior R.E.M.E. officers took part in the Exercise. They were formed into syndicates and held discussions and made reports on organisation, production, and personnel problems. These reports were put forward and debated during the exercise and are now receiving detailed analysis from the directing staff. It is planned to hold a similar Exercise every year.

The General Officer Commanding the Aldershot District was present at some of the discussions, as also was Major-General S. W. Joslin, M.B.E., who is the Director of Mechanical Engineering. Brigadier E. R. Ash, who was in charge of the Exercise, has informed the Institution that Major-General Joslin is looking forward to receiving his final report on it.

CONFERENCES ON MATERIAL HANDLING

In addition to the One Day Conference on Material Handling to be held by the Coventry Section on 20th May, 1950, as announced in the December, 1949, Journal, a similar Conference has been arranged by the Western Section.

This will take place in Bristol on 13th May, 1950, and invitations will be issued to all members of the Institution in the South-Western area.

INSTITUTION OF WORKS MANAGERS

At the recent Annual General Meeting of the I.W.M., the Deputy Chairman, Mr. J. Connell, F.R.I.C., F.I.W.M., who presided, reported the steady progress which the Institution is making. The merger between the I.W.M. and the Institution of Factory Managers had been consolidated during the year, three new provincial branches had been established, and the Institution was now publishing a monthly Journal.

Attention was also drawn to the inception of the examination scheme ; the award of a special grant to Mr. A. P. Young, O.B.E., M.I.E.E., F.I.W.M., Chairman of the Institution, to enable him to

visit the U.S.A. on behalf of the I.W.M. ; the holding of the First National Conference; and the gratifying increase in membership.

TECHNICAL APPOINTMENT Applications are invited for appointment as Senior Assistant in the Technical College, Bradford, to give general assistance to the Principal, and to participate in the teaching of Industrial Administration and Management. The salary, including allowances, may range from £700 to £905 p.a., according to the Burnham Scale.

Further particulars and forms of application may be obtained from the Director of Education, Town Hall, Bradford.

FINE MEASUREMENT AND PRECISION MANUFACTURE A Refresher Course on Fine Measurement and Precision Manufacture will be held at the Wolverhampton and Staffordshire Technical College (Principal W. E. Fisher, O.B.E., D.Sc.), on March 16th, 17th and 18th, 1950. The course will be under the tutorship of Mr. J. Loxham, M.I.Mech.E., M.I.Prod.E., F.R.S.A., and will offer an authoritative survey of present knowledge and advanced practice.

Application for entry to the course should be made in person at the College office, or by post to the Principal.

HISTORY OF THE MUSHETS Mr. Fred M. Osborn, Chairman of Samuel Osborn & Co. Ltd., is engaged on writing a history of David Mushet (1772-1847) and Robert Forester Mushet (1811-1891)—both distinguished metallurgists of their day. David Mushet was responsible for the discovery of the Blackband ironstone of Scotland, and Robert Mushet was associated with Sir Henry Bessemer in the perfection of his process, and also discovered self- or air-hardening steel, the pioneer tool steel.

If any members have information or documents covering the Mushet era, that is, from about 1860-1900, Mr. Osborn would be very grateful for their assistance in compiling the history.

BRITISH STANDARDS The following Standard has recently been issued and is obtainable from the British Standards Institution, 28, Victoria Street, Westminster, S.W.1 :

1599 : 1949 Identification Numbers for Cylinders of Internal Combustion Engines (other than aircraft engines) (price 2/- post free).

I.P.E. Representative on appropriate B.S.I. Committee : Mr. J. E. Baty.

NEWS OF MEMBERS

Mr. W. H. Cockerill has been appointed Works Manager of Castings, Ltd., Walsall.

Mr. E. C. Gregg is now Managing Director of Associated British Oil Engines (Marine) Ltd.

Mr. Robert Hedley has been appointed lecturer at the Redway Technical College, Gillingham.

Mr. N. Holmes is now Assembly Methods Engineer at W. & T. Avery, Ltd., Sherburn-in-Elmet.

Mr. R. L. Kapoor has recently joined the Indian Army as Major in the Corps of Indian Electrical and Mechanical Engineers.

Mr. S. R. Kay is now Assistant Engineer, Sales & Contracts Dept. (Gas Works & Chemical Plant), of Newton, Chambers & Co. Ltd.

Mr. M. H. Ketteridge has been appointed Works Manager of British Australia Cables Pty. Ltd.

Mr. A. B. Lloyd has been appointed Sales Director of F. H. Lloyd & Co. Ltd., and its two subsidiaries, Lloyds (Burton) Ltd. and Parker Foundry (1929) Ltd.

Mr. R. Shilton has taken up an appointment as Lecturer in the Department of Mechanical Engineering at the University of Leeds. He will be responsible for establishing and organising classes in Production Engineering, a subject which has not previously been included in the curriculum of the University.

Mr. Y. Tandan is now Assistant Superintendent of Development (Weapons) in charge of Final Inspection at the Ordnance Factory and Small Arms Factory at Kanpur.

Mr. C. H. Tyers has taken up an appointment as Assistant to the Consulting Mechanical Engineer at Wallis Engineering Co., Solihull.

OBITUARY The Institution deeply regrets to announce the death of Mr. E. L. Stead, Associate Member, of Yorkshire Section.

BOOKS RECEIVED " Technology of Light Metals " by A. von Zeerleder. Elsevier Publishing Co. Inc., New York. $7.50.

A study of this excellent publication will reveal the interesting fact that the author has produced a text book more from the point of view of the engineer than the metallurgist.

Both the engineer and the student in search of up-to-date technical data, both from the standpoint of design and application, will find much to commend this volume.

A keen observer may be a little puzzled at first to find that the British Specifications of light alloys which he meets in everyday life are not referred to in the book, but the reader must bear in mind that the book has a primarily Swiss background with the close support of modern American techniques.

The wide variety of processes so ably dealt with, together with their excellent illustrations, make this book a welcome addition to the production engineer's reference library.

D. H. M.

" Ships " by J. S. Redshaw. Published by Vickers-Armstrongs, Ltd.

" Permanent Magnets." Published by William Jessop & Sons, Ltd.

" Industrial Diamond Trade Names Index for 1950." Compiled by Industrial Diamond Information Bureau and Industrial Diamond Review.

IMPORTANT In order that the Journal may be despatched on time, it is essential that copy should reach the Head Office of the Institution not later than 40 days prior to the date of issue, which is the first of each month.

ISSUE OF JOURNAL TO NEW MEMBERS Owing to the fact that output has to be adjusted to meet requirements, and in order to avoid carrying heavy stocks, it has been decided that the Journal will only be issued to new Members from the date they join the Institution.

SECTION MEETINGS

The following meetings have been arranged to take place in March and April, 1950. Where full details are not given, these have not been received at the time of going to press.

March

1st **Coventry Graduate Section.** A lecture on "Gear Cutting Procedure" will be given by Mr. H. Pearson, B.A.(Oxon.), in Room A.5, Coventry Technical College, The Butts, Coventry, at 7-15 p.m.

1st **Nottingham Section.** The Annual General Meeting, which will be followed by sound films of general engineering interest, will be held at the Victoria Station Hotel, Milton Street, Nottingham, at 7-00 p.m.

1st **Preston Section.** A lecture on " Modern Foundry Practice " will be given by Mr. C. S. Johnson, at the Harris Institute, Corporation Street, Preston, at 7-15 p.m.

1st **Wolverhampton Section.** A lecture on "Manufacture and Application of Gears " will be given by Mr. J. P. G. Rhind, B.Sc., A.M.I.Mech.E., at the West Midland Gas Board Demonstration Room, Clarence Street, Wolverhampton, at 7-00 p.m.

2nd **Glasgow Section.** An Informal Discussion on " Foremanship " will be presented by Mr. H. Gardner, M.I.Mech.E., M.I.Prod.E., at the Institution of Engineers and Shipbuilders, 39, Elmbank Crescent, Glasgow, C.2, at 8-00 p.m.

4th **Yorkshire Graduate Section.** A visit has been arranged to the British N.S.F. Co. Ltd., Ingrow Bridge Works, Keighley, the manufacturers of Radio and Electrical Components, commencing at 2-30 p.m.

March—*cont.*

6th **Halifax Section.** A lecture on "Costing as an Aid to Management" will be given by Mr. H. H. Norcross, A.I.Prod.E., F.C.W.A., F.I.I.A., at Whiteley's Cafe, Westgate, Huddersfield, at 7-15 p.m.

6th **Yorkshire Section.** The Annual General Meeting will be held at the Hotel Metropole, King Street, Leeds, 1, at 7-00 p.m.

7th **Wolverhampton Graduate Section.** A lecture on "Machine Tool Trends" will be given by Mr. C. Eatough, B.Sc., M.I.Mech.E., at the West Midland Gas Board Demonstration Room, Wolverhampton. The Annual General Meeting will precede this lecture at 7-00 p.m.

8th **N. Ireland Section.** A lecture on "Colour Schemes for Factories and Machines" will be given by Mrs. D. M. Buckland at the Municipal College of Technology, Belfast, at 7-00 p.m.

8th **Southern Section.** A lecture on "How the Money Moves in Business" will be given by Mr. T. G. Rose, M.I.Mech.E., M.I.Prod.E., F.I.I.A., in the Physics Theatre, University College, Southampton, at 7-15 p.m.

9th **Cornwall Section.** A lecture on "Diesel Engine Development" will be given by Mr. Freeman Sanders, M.I.A.E., at Holman's Canteen, Dolcoath Road, Camborne, at 7-15 p.m.

9th **London Graduate Section.** A lecture on "The Graduate's Opportunity in Industry" will be given by Mr. B. H. Dyson, M.I.Prod.E., F.I.I.A., at the Institution of Production Engineers, 36, Portman Square, London, W.1, at 7-15 p.m.

10th **Coventry Section.** A Dinner and Dance has been arranged to take place at the Masonic Hall, Coventry.

10th **W. Wales Sub-Section.** A lecture on "The Effective Use of Metals" will be given by Dr. E. G. West, B.Sc., in the Central Library, Alexandra Road, Swansea, at 7-30 p.m.

13th **Sheffield Section.** A lecture on "Development in Design and Manufacture of Heavy Steel Works Plant" will be given by Mr. W. Bailey, at the Royal Victoria Station Hotel, Sheffield, at 6-30 p.m.

14th **Birmingham Graduate Section.** A lecture on "Production Methods for Medium Sized Presswork" will be given by Mr. J. L. Williams, A.M.I.Mech.E., M.I.W., at the James Watt Memorial Institute, Great Charles Street, Birmingham, 3, at 7-00 p.m.

14th **Dundee Section.** A lecture on "How the Money Moves in Business" will be given by Mr. T. G. Rose, M.I.Mech.E., M.I.Prod.E., F.I.I.A., at Mathers Hotel, Whitehall Crescent, Dundee, at 7-15 p.m.

15th **Birmingham Section.** A lecture on "Modern Forging Practice" will be given by Mr. J. Sharman at the James Watt Memorial Institute, Great Charles Street, Birmingham, 3, at 7-00 p.m. The Section Annual General Meeting will follow the lecture.

15th **Edinburgh Section.** The Annual General Meeting will be held, followed by a Discussion, and Supper. The time and place will be announced later.

15th **Liverpool Section.** A lecture on "Methods of Protection Against Metallic Corrosion" will be given by Mr. T. A. Evans, F.R.I.C., at Radiant House, Bold Street, Liverpool, at 7-15 p.m.

15th **Manchester Section.** A lecture on "Advance in Industrial Heat Treatment" will be given by Mr. J. McHenry, A.M.I.F., A.M.I.T., at the Mechanics Institute, Crewe, commencing at 7-15 p.m.

March—*cont.*

15th **Western Section.** A lecture on "Some Aspects of the Fabrication and Welding of Stainless and Heat Resisting Steels" will be given by Mr. F. Jukes, A.M.I.Mech.E., A.M.I.W., at the Grand Hotel, Bristol, at 7-15 p.m.

16th **Glasgow Section.** A lecture on "Effective Use of Materials" will be given by Messrs. J. Binnie, A.M.I.Prod.E., F. H. Perkins, A.M.I.Prod.E., and J. Platt, A.M.I.Prod.E., at the Institution of Engineers and Shipbuilders, 39, Elmbank Crescent, Glasgow, C.2, at 8-00 p.m. This lecture will be followed by the Annual General Meeting.

16th **Manchester Graduate Section.** A Film Show on "The Manufacture and Use of Tungsten Carbides" will be given by Mr. P. G. Bell, in the Reynolds Hall, College of Technology, Manchester, at 7-15 p.m. This will be preceded by the Annual General Meeting at 6-45 p.m.

17th **Coventry Section.** A lecture on "Some Notable Aluminium Alloy Castings" will be given by Mr. A. R. Martin, at the Greyfriars Rooms, The Geisha Cafe, Hertford Street, Coventry, at 7-00 p.m.

17th **E. Counties Section.** A Discussion will be held on "Developments in Production Engineering in the Eastern Counties Section During the Past Year." This will be preceded by the Annual General Meeting at 6-30 p.m. at the Oriental Cafe, Westgate Street, Ipswich.

17th **N. Eastern Graduate Section.** A lecture on "Welding" will be given by Mr. R. B. Williams, Grad.I.Prod.E., Chairman of the Graduate Section, in the Neville Hall Mining Institution, Westgate Road, Newcastle-upon-Tyne, 1, at 7-00 p.m.

18th **Yorkshire Graduate Section.** A lecture on "Education and Industry" will be given by Capt. G. E. Knight, at the Great Northern Station Hotel, Leeds, 1, at 2-30 p.m. This will be preceded by the Annual General Meeting, which will commence at 2-15 p.m.

20th **Derby Sub-Section.** The Annual General Meeting, which will be followed by films, will be held at the School of Art, Green Lane, Derby, at 7-00 p.m.

20th **North Eastern Section.** The Annual General Meeting, which will be followed by a lecture on "Gear Cutting," will be held at the Neville Hall Mining Institution, Westgate Road, Newcastle-upon-Tyne, 1, at 7-00 p.m.

22nd **Luton Graduate Section.** A lecture on "Product Packaging" will be given by Mr. J. Evan-Cook, in the Small Assembly Room, Town Hall, Luton, at 7-30 p.m.

22nd **S. Wales and Monmouthshire Section.** A lecture on "Efficient Tooling for Production" will be given by Mr. B. Holloway, A.M.I.Prod.E., at the South Wales Institute of Engineers, Park Place, Cardiff, at 6-45 p.m.

23rd **Leicester and District Section.** An Address will be given by the Section President, Mr. J. Wombwell, M.B.E., in Room 104, The Leicester College of Technology, The Newarke, Leicester, at 7-00 p.m., preceded by the Annual General Meeting at 6-30 p.m. A film, "Tools for the Job," will be shown at approximately 7-15 p.m.

23rd **London Section.** A lecture on "The Effective Use and Selection of Materials" will be given by Dr. R. Genders, M.B.E., D.Met., F.R.I.C., F.I.M., at the Royal Empire Society, Northumberland Avenue, London, W.C.2, at 7-00 p.m. This will be preceded by the Annual General Meeting.

24th **Coventry Graduate Section.** A lecture on "Production on Capstan Lathes" will be given by Mr. R. C. Fenton, M.I.Prod.E., in Room A.5, Coventry Technical College, The Butts, Coventry, at 7-15 p.m.

March—*cont.*

24th **Western Section.** A lecture on "Jig and Tool Design" will be given by Mr. R. O. Jeakings, at the University College of the South West, Exeter, at 7-30 p.m.

25th **Birmingham Section.** An Annual Dinner and Dance will be held at the Botanical Gardens, Edgbaston.

27th **Manchester Section.** A lecture on "Valid Incentives (Payment by Results Examined)" will be given by Mr. E. C. Gordon England, F.R.Ae.S., M.I.Prod.E., F.I.I.A., at the College of Technology, Sackville Street, Manchester, at 7-15 p.m. This will be preceded by the Annual General Meeting at 6-30 p.m.

28th **Birmingham Graduate Section.** An afternoon visit has been arranged to Jaguar Cars Ltd., Coventry.

28th **Lincoln Sub-Section.** A visit has been arranged to Messrs. Ruston & Hornsby Ltd., Boultham Works, Lincoln, commencing at 7-00 p.m. This will be preceded by the Annual General Meeting.

28th **London Graduate Section.** A visit has been arranged to C.V.A. Jigs, Moulds & Tools Ltd., Portland Road, Hove, 3, Sussex.

28th **Luton, Bedford and District Section.** A lecture on "Diamonds in Industry" will be given by Mr. J. J. Smit, in the Small Assembly Room, Town Hall, Luton, at 7-00 p.m.

29th **N. Ireland Section.** A film evening and the Annual Genera Meeting have been arranged to take place at the Municipal College of Technology, Belfast, at 7-00 p.m.

29th **Shrewsbury Sub-Section.** A lecture on "Sand Casting" will be given at the Walker Technical College, Oakengates, at 7-30 p.m.

29th **Western Section.** The Annual General Meeting will be held at the Grand Hotel, Bristol, at 7-15 p.m.

April

4th **London Graduate Section.** A lecture on "In Search of a Procedure for the Introduction of Improvements" will be given by Mr. A. P. Oppenheimer, B.Sc., Grad.I.Prod.E., at the Institution of Production Engineers, 36, Portman Square, London, W.1, at 7-15 p.m.

5th **Halifax Graduate Section.** A lecture on "The Production of All Metal Bus Bodies" will be given by Mr. G. L. Hart, A.M.I.Mech.E., at the Huddersfield Technical College, Huddersfield, at 7-00 p.m.

5th **Manchester Graduate Section.** A lecture on "The Extrusion of Metals" will be given by Mr. J. A. Richmond, in the Reynolds Hall, College of Technology, Manchester, at 7-15 p.m.

5th **Nottingham Section.** A lecture on "Costing for Small Engineering Firms" will be given by Mr. J. H. Smith, F.S.A.A., F.C.I.S., at the Victoria Station Hotel, Milton Street, Nottingham, at 7-00 p.m.

5th **Wolverhampton Section.** A lecture on "Industrial Finishes" will be given by Mr. A. W. Wallbank, B.Sc., F.R.I.C., at the West Midland Gas Board Demonstration Room, Clarence Street, Wolverhampton, at 7-00 p.m.

11th **Wolverhampton Graduate Section.** A lecture on "Spring Manufacture" will be given at the Wisemore School, Wallsall, at 7-15 p.m.

April—*cont.*

14th **Southern Section.** A lecture on "Production Management Problems" will be given by Mr. M. Seaman, M.Sc., M.I.Mech.E., A.M.I.E.E., M.I.Prod.E., in the Physics Theatre, University College, Southampton, at 7-15 p.m.

14th **W. Wales Sub-Section.** A lecture on "The Oil Industry and the Llandarcy Expansion Project" will be given by Messrs. I. Cameon and P. F. Ellis, at the Y.M.C.A., St. Helen's Road, Swansea, at 7-30 p.m.

14th **Wolverhampton Graduate Section.** The Annual Dance will take place at Beatties Restaurant, Wolverhampton, from 7-00 p.m.

17th **Derby Sub-Section.** A lecture on "Production on Capstan Lathes" will be given by Mr. R. C. Fenton, M.I.Prod.E., at the School of Art, Green Lane, Derby, at 7-00 p.m.

17th **Sheffield Section.** A lecture on "Joint Consultation in Industry" will be given by Messrs. F. E. Maer, M.I.Prod.E., and C. Dee, at the Royal Victoria Station Hotel, Sheffield, at 6-30 p.m.

19th **Birmingham Section.** A lecture on "Planning for Production, Incorporating Cost Control" will be given by Mr. C. W. Higgins, A.C.I.S., A.C.C.A., A.M.I.I.A., at the James Watt Memorial Institute, Great Charles Street, Birmingham, 3, at 7-00 p.m.

19th **Liverpool Section.** The Annual General Meeting will take place at the Exchange Hotel, Tithebarn Street, Liverpool, at 7-30 p.m.

19th **Luton Graduate Section.** A lecture on "Surface Coatings and Finishes" will be given by Mr. C. A. J. Taylor, M.Sc., A.R.I.C., in the Small Assembly Room, Town Hall, Luton, at 7-30 p.m.

19th **Western Section.** A lecture on "Foremanship" will be given by Mr. A. P. Young, O.B.E., at the Grand Hotel, Bristol, at 7-15 p.m.

20th **London Section.** A lecture on "Mass Production of a British Alarm Clock" will be given by Mr. E. Desmond at the Royal Empire Society, Northumberland Avenue, London, W.C.2 (using the entrance in Craven Street, Charing Cross), at 7-00 p.m.

24th **Manchester Section.** A lecture on "Developments in Oxygen Cutting" will be given by Mr. R. E. Doré, at the College of Technology, Sackville Street, Manchester, at 7-15 p.m.

26th **Shrewsbury Sub-Section.** A lecture on "The Production Engineer—His Education and Training" will be given by Mr. T. B. Worth, M.I.Mech.E., A.M.I.E.E., M.I.Prod.E., at the Technical College, Shrewsbury, at 7-30 p.m.

26th **S. Wales and Monmouthshire Section.** A lecture on "Motion Study" will be given by Miss Anne G. Shaw, M.A., M.I.Prod.E., at the South Wales Institute of Engineers, Park Place, Cardiff, at 6-45 p.m.

27th **London Graduate Section.** A lecture on "Mechanical Handling Techniques" will be given by Mr. W. J. Dimmock, A.M.I.Prod.E., at the Institution of Production Engineers, 36, Portman Square, London, W.1, at 7-15 p.m.

29th **London Graduate Section.** A visit has been arranged to the National Physical Laboratory, Teddington, Middlesex, commencing at 2-30 p.m.

SECTION ACTIVITIES

BIRMINGHAM The programme of lectures and social activities is now in full swing and playing an important part in the membership campaign. Attendances at lectures are well maintained, and are limited only by available accommodation.

The opening lecture was on " Industrial Incentives " by Mr. R. M. Morland, and this was followed by Mr. R. C. Fenton's paper on " Production on Capstan Lathes." In November, Mr. B. F. Bregi, Executive Engineer of the National Broach and Machine Tool Co., Detroit, lectured on " The Science of Gear Tooth Production." Such was the interest shown in this paper that a party of visitors stood to hear it.

In December members joined with the Incorporated Plant Engineers for a discussion on " Steam and Its Relation to Production." Provisional arrangements are being made for a special meeting in March, 1950, when Professor Juran, of New York University, will give an address.

The Christmas Party and Carnival Dance was a highly successful function and guests included members of the Coventry and Wolverhampton Section Committees, Mr. J. M. Steer, Hon. Secretary of the Sydney Section, and Major and Mrs. Thorne.

BOMBAY The activities of the Section continue in a most satisfactory manner. Meetings were held in October and November, when lectures were given on " Cutting Tool Design and Practice " by Mr. C. E. Thompson, A.M.I.Prod.E., and the " Psychology of Production " by Mr. J. T. Foster.

CALCUTTA The Session commenced with a most interesting address by the Section President, Mr. T. R. Gupta, M.I.Prod.E., in October, and was followed in November by a talk on " Centreless Grinding " by Mr. G. Reed, Grad.I.Prod.E. In addition, several factory visits have been arranged.

CORNWALL A lecture given by Mr. T. A. Stevens, A.M.I.Mech.E., M.I.Prod.E., in October, on " Fundamentals of Press Design," was very well received, and in November papers on " Mining," " Concentrating & Dressing " and " Metallography " were presented by Col. G. A. Whitworth, O.B.E., Mr. F. B. Michell, B.Sc(Eng)., and Major Canning, M.C., T.D., B.Sc(Eng). The speakers dealt clearly and thoroughly with tin mining and production, particularly in the Cornish area.

COVENTRY GRADUATE In September, Mr. A. E. Fisher, the 1949 winner of the Douglas D. Davis award, gave his prizewinning paper, " The Production of Screw Threads." Following the lecture, Mr. Fisher received his award from Mr. Davis.

The October meeting took the form of a discussion led by Mr. T. B. Worth, Education Officer, on " Graduate Status—Its Responsibilities and Implications." Mr. R. L. Tandy's lecture in November had to be cancelled owing to the illness of the speaker, and in its place the Section Chairman presented a paper on " Incentives."

The Section Committee has given much thought to the formation of Study Groups, and the matter will be discussed further with Mr. Worth.

DERBY The first three lectures of the Session, on " Air Operated Fixtures," " Cast Iron as an Engineering Material," and " The Mass Production of a British Alarm Clock," were well attended, and the Joint Meeting with the Institute of Industrial Administration on " Industrial Design," held in December, was highly successful. It is hoped that this will be the forerunner of other joint meetings.

DUNDEE The new Section has now been successfully launched. Meetings were held in October and November, and the latter especially was an outstanding success. On this occasion Miss Anne Shaw, M.A., M.I.Prod.E., gave a paper on " Motion Study."

The Committee has met five times, and it is felt that the affairs of the Section are now firmly established on a sound basis.

EASTERN COUNTIES In October, Mr. Jukes' lecture on " Design for Welding " attracted considerable interest, and members of the local branch of the Institute of Welding were invited to attend. There was also an excellent attendance for Mr. T. H. Nicholson's lecture on " Management Through Cost Control," in November.

EDINBURGH The Session opened with a first-class lecture by Mrs. W. Raphael, of the Institute of Industrial Psychology, on " Joint Consultation—Some Practical Problems." The Section was joined on this occasion by the East of Scotland branch of the Institute of Personnel Management.

In addition to lecture meetings, four Works Visits were arranged and were well supported.

GLASGOW The first two lectures of the Session were well attended, the second—at which Miss A. Shaw, M.A., M.I.Prod.E., gave her paper on " Motion Study "—being the largest meeting ever held in Glasgow.

An Informal Discussion Evening was held in November, and this resulted in a number of valuable suggestions which were of much interest and help to members.

HALIFAX The first lecture of the Session was given by Mr. T. L. Gardner on " Some Practical Aspects of Gas Turbines." This was followed in November by " Efficient Production Methods Applied to Iron Founding," by Mr. G. W. Nicholls, and in December by " The Production of Form Grinding Wheels by Crushing and Diamond Dressing " by Messrs. Jellis and James.

The Annual Dinner was held on November 16th, when the chief guests were the Mayor of Halifax, Mr. G. M. Butler, and Mr. J. E. Hill, Chairman of Council.

LINCOLN The Session was opened in September, when a very interesting lecture on " Aluminium Castings in Engineering " was given by Messrs. Keeble and Caven. In October members of the Section, together with members of the Grantham Engineering Society, visited the Titanic works of Clayton Dewandre, Ltd., and this was followed in November by an evening visit to Ransome and Marles Bearing Co., at Newark-on-Trent.

LIVERPOOL For the September lecture Mr. S. A. Ghalib, B.Sc., gave his paper on " Electronic Control of Machine Tools and Self Regulating Fixtures." The meeting was very well attended and a most interesting lecture was followed by a very good discussion.

The informal discussion evening in October produced some valuable comments. Chief interest was centred round the question of maintaining quality in production so that British goods will find a ready market abroad.

A record attendance was shown in November, for Mr. C. M. P. Willcox's lecture on " Air Operated Fixtures."

The membership has now been doubled since the formation of the Section.

LONDON The lectures by Mr. B. F. Bregi, of the National Broach & Machine Tool Company, U.S.A., on "Modern Methods of Gear Production," and by Mr. L. W. Robson, F.C.A., A.I.Prod.E., F.C.W.A., on " Budgetary Control & Standard Costs from the Production Engineer's Standpoint " both proved to be very popular and created lively discussions.

The attendance at both lectures was approximately 300 members and visitors.

Mr. W. Core, the Section President, has accepted nomination to the Board of Governors of Wandsworth Technical College, and Mr. C. C. Ferguson for the S.E. London Technical College.

LONDON GRADUATE Four lecture meetings and four factory visits have been held during the quarter. In addition four Study Groups have been formed and there is every indication that these will be popular.

Arrangements are now proceeding for a fortnight's industrial tour of Sweden, to take place in June, 1950. The tour will include visits to several leading Swedish factories. A sub-committee is making arrangements for members to spend three months in an American factory during 1950. Members of all Graduate Sections will be invited to take part in both the Swedish and American tours.

The Section Committee has received a great deal of valuable advice and encouragement from the President and Secretary of the London Section. It is certain that this co-operation will enable the Graduate Section Committee to improve and increase the activities of their Section.

MANCHESTER In October members and friends enjoyed a Dinner and Social Evening, and the success of this event was such as to warrant making the occasion bi-annual rather than annual.

The lecture programme commenced on a high level with Lt. Col. L. Urwick's paper, " Education for Management," and in October, Mr. A. M. Robertson gave a most interesting lecture, " Recent Developments in the Glass Industry." This was followed in November by a visit to the works of Fibreglass, St. Helens.

Mr. B. F. Bregi's lecture on " Gear Shaving " attracted such a large audience that a number of those attending had to stand throughout the evening. Over 30 members from adjoining Sections attended this meeting.

In November an interesting paper was presented by Mr. Archer on " The Effective Use of Materials."

At Crewe, two lectures, " Developments in Oxygen Cutting " by Mr. Ryalls, and a repetition of Mr. Robertson's paper on " Recent Developments in the Glass Industry," were well received.

MANCHESTER GRADUATE During this quarter the Section has enjoyed four lecture meetings and works visits. The November lecture on " Mechanised Foundries " by Mr. H. A. Fox, was particularly well attended.

MELBOURNE In July a most interesting paper on " Oxy-acetylene Welding & Cutting in Production " was given by Mr. E. J. Raymond, and was followed a week later by a demonstration at the works of the Commonwealth Industrial Gases Pty. Ltd.

In August, Mr. J. Wong Yen, A.M.I.Prod.E., spoke on " Dimensional Control and its Application to Production," and in September a most enlightening and thought-provoking address was given by Mr. John Storey on " The Place of the Production Engineer in the National Economy."

The Annual General Meeting held in October was followed by a lecture on " Design and Drawing Practice in relation to Production

Engineering," by Mr. C. A. Gladman, M.I.Prod.E., Head of the Production Engineering Dept., of Sydney Technical College. His lecture drew the record attendance of the year.

During October, members were glad to welcome back Mr. H. le Cheminant, M.I.Prod.E., a member of the Section Committee, who had been on a visit overseas.

NEW ZEALAND The Inaugural Meeting of the Section was held in Auckland on 10th October, 1949, and a working Committee of three members was elected.

A programme of lecture meetings is being drawn up and it is anticipated that this will be put into effect early in 1950.

NORTH-EASTERN GRADUATE A lecture given in September by Mr. T. B. Worth, Education Officer, entitled " Graduate Status—Its Responsibilities and Implications," was well received by an enthusiastic audience. The visit to Elswick Lead Works in October was well attended and proved to be of unusual interest. The last meeting of the quarter was held in November, when a documentary film on " Mechanical Handling " was shown.

NOTTINGHAM In November, Mr. Rogers discussed " Mechanised Mining," illustrating his talk with four sound films of exceptional interest. In December, Mr. L. White outlined " Recent Developments in Plastics," when samples of the latest materials were on view, and the meeting closed with the showing of two sound films dealing with the subject.

PRESTON At the first winter meeting a lecture on " Mechanical Handling " was given by Mr. F. T. Dean. The following meeting was attended by Mr. T. B. Worth, Education Officer, who convinced all members that he has a full grasp of his subject and the needs of the Institution.

In December, a lecture on " Costing As An Aid To Management " was given by Mr. H. H. Norcross.

SHEFFIELD In November, Mr. F. R. Francis spoke on " The Production of Cutlery Blanks." This lecture provoked a very lively discussion, and showed the interest of the users of the old-established methods.

SOUTH AFRICA In October a highly successful film evening was held, and in November, Mr. H. H. Waters, a member of the South African Sub-Council, lectured on " Gear Cutting Practice."

Mr. J. Cowan gave a paper on " Calcining Plant " to a well-attended meeting in December, and a large number of members took part in the November visit to First Electric Corporation.

SOUTH WALES & MONMOUTHSHIRE At the first meeting of the Session in October, Mr. T. B. Worth, Education Officer, spoke on "The Production Engineer—His Education and Training" to a large gathering of members and local educationalists.

In November, Mr. E. C. Gordon England, M.I.Prod.E., spoke on "Payment by Results Critically Examined." This paper provoked the most lively discussion the Section has experienced for a long time.

A series of lectures in the Merthyr Tydfil area commenced in December. This arrangement has been made possible by the kind co-operation of the Hoover Company and Mr. A. R. Northover, M.I.Prod.E. The lectures chosen are of a progressive nature, starting with "Apprentice Training." An excellent paper on this subject was read by Mr. F. G. Simmonds.

SYDNEY The Annual Supper Dance, which took place in June, 1949, was thoroughly enjoyed. Two papers were presented during the Session, "Some Problems of Personnel Management" by Mr. H. F. Benning, M.A., Dip.Ed., and "Tooling Up For the Australian Car" by Mr. W. R. Rowell. During October a number of members spent a very interesting day at the Small Arms Factory, Lithgow.

WESTERN A number of excellent lectures has been given since the beginning of the Session, and the interest shown in Section activities has been most encouraging. Meetings have been held in Bristol, Stroud, Exeter, and Chippenham, with most satisfactory results. One of the most interesting papers was given by Mr. Walker Puckey on "The Measurement of Productive Efficiency" and the Section hopes to receive another visit from this speaker.

The Dinner and Dance held on December 1st was an outstanding success, and members had the pleasure of receiving Mr. and Mrs. E. Percy Edwards (deputising for Dr. H. Schofield, who was unable to attend owing to pressure of business), the Lord Mayor and Lady Mayoress of Bristol, the Sheriff and his Lady, Mr. and Mrs. Norman Rowbotham, and other distinguished visitors.

WOLVERHAMPTON Lecture meetings held each month have attracted a good attendance. The Section Committee Meetings have also been held monthly and much work has been dealt with on behalf of the Section.

WOLVERHAMPTON GRADUATE In October a large audience was present at the showing of a film on "Mechanical Handling," and in November an attendance of both Senior and Graduate members enjoyed an excellent presentation of Mr. H. W. Greenwood's paper on "Powder Metallurgy."

All-day visits were organised on two days in November to the factories of Joseph Lucas, Ltd., Birmingham, and a visit was made to the Wednesfield works of Joshua Bigwood, Ltd., in December.

The recently formed Social Sub-Committee has held its first meeting, and arrangements are well in hand for the Easter 1950 dance.

YORKSHIRE In October the Section enjoyed a paper on " The Adaptability of the Jig Bore Machine for Use on Production Machines " by Mr. B. J. Sayer. In November a lecture on " Metal Spraying " was given by Mr. J. B. Marshall and, in December, Mr. G. H. Bottomley, a member of the Graduate Section, spoke on " Latest Development of Grinding Machines." This was followed by a visit to John Lund, Ltd., Keighley.

YORKSHIRE GRADUATE In September a visit was made to the City of Bradford Sewage Disposal Works. The documentary film, " Mechanical Handling " was shown in October and later in the month members visited the C.I.D. Block, West Riding Constabulary, Wakefield.

In November a Committee Meeting was held to discuss the formation of Study Groups ; Mr. T. B. Worth also gave the opening address on " Graduate Status—Its Responsibilities and Implications."

Later in the month another Committee Meeting was held in connection with the formation of Study Groups, and it was agreed to call a general meeting in January, 1950, to make the necessary arrangements.

INTERIM REPORT OF THE JOINT COMMITTEE ON MEASUREMENT OF PRODUCTIVITY

A Brief Review of Response and Publicity

Members of the Institution of Production Engineers and the Institute of Cost and Works Accountants have now had the opportunity of studying the Report, and might wish to learn of its reception by the Press and in other quarters.

All are agreed, in the main, that whilst little progress has been made as yet in the measurement of productivity, some interesting facts emerging from the preliminary investigation are of much importance. *The Times* of December 1, 1949, commented upon the Report in its second leader, and underlined the part which drew attention to the fact that capital equipment in industrial plants is rarely used as much as it could be. It also drew attention to the variations in basic and allowed times set by time study engineers for an identical operation. On the other hand, the *Times Review of Industry* for January commented mainly on the problem of devising common measurements simple enough to be of use to departmental foremen. This journal also referred to the lack of effective cost and statistical information made available at supervisory level.

THE PROVINCIAL PRESS A good press was given to the Report by the provincial daily newspapers. The Report was released at a time when much space was being given by the Press generally to the question of incentive bonus schemes of payment. The *Sheffield Telegraph*, for instance, followed a main feature on the question of a wage claim by the Amalgamated Engineering Union by referring to the Report of the Joint Committee in the following terms :—

" Before incentive bonus schemes become more widespread in industry, the system on which they are based should be thoroughly revised.

" Uniform principles of production measurement should be set out for each industry and time study engineers should be trained at courses sponsored by the Ministry of Education.

" Those recommendations are made by a joint committee of the Institution of Production Engineers and the Institute of Cost and Works Accountants working in association with the Anglo-

American Productivity Council, and are to be circulated throughout industry and brought to the notice of Government departments."

Manchester, South Wales, and Newcastle papers adopted much the same attitude, referring to the need for a revision of incentive schemes in industry. Both the main Scottish dailies, *The Scotsman* and the *Glasgow Herald*, emphasised this point, and also accentuated the under-utilisation of equipment in British industry mentioned in the Report.

As might be expected because of the industrial process used in the investigation (automatic lathes), the technical press in the engineering and allied industries gave prominence to the Report. It was reproduced in *The Machinist* for December 3, and comment was invited from readers. A paragraph from the leading article for that issue devoted to the Report reads :—

" Most commendable feature of the committee's approach to the job has been their aim to keep their work and their recommendations on a practical plane, and that has undoubtedly presented them with their major problem. It is easy enough to talk and to write on this subject in a general way, as many people already have done. To provide industry with a practical tool to help them on the job is quite another matter."

The Chamber of Commerce Journal, in the January issue, included a resumé, and the well known management publication, *Business*, printed it in full in its issue for December.

Accountancy, the journal of the Society of Incorporated Accountants and Auditors, gave much prominence to the Report in the January issue. The leading article, on the theme of cost accounting and the measurement of efficiency, devoted by far the greater part of its space to a constructive criticism of the work being carried out by the Joint Committee. The leader opened with a reference to an announcement by Sir Norman Kipping, at a luncheon of the Incorporated Accountants' London and District Society, that a mission of accountants is to visit the United States to report upon cost and works accounting methods there. The article went on :—

" If the common impression is correct that the United States is far in advance of this country in efficiency comparisons and time studies, the mission that is going to the United States would do well to consider these bigger and broader problems as well as those of cost accounting proper. Cost accounting can do a great deal, but the accountancy profession, in particular, must be wary of claiming too much for it. When the mission is appointed and its term of reference fixed the report of the Institution of Production Engineers and the Institute of Cost and Works Accountants should be borne in mind."

Local Government Finance, the official journal of the Institute of Municipal Treasurers and Accountants, and *The Certified Secretaries' Journal*, also featured the Report.

GENERAL INTEREST SHOWN The distributors (Macdonald & Evans) report that there is a steady demand for copies from industrial concerns. Trade and employers' associations, through their officials, have welcomed the work being undertaken by the Committee. Mr. E. P. Harries, of the Trades Union Congress, comments favourably on paragraph 2 of the Report, and states: " I think a lot of this talk about working extra overtime is a very uneconomic way of increasing production and avoids the basic problems of productivity."

Government and semi-Government Departments have expressed considerable interest in the work, and Dr. Alexander King, of the Lord President's Office, thought that the point made in paragraph 3, concerning the lack of information and agreement on basic principles, was most significant, and that a great deal could be achieved by clarifying these principles. Dr. King continues : " I was most interested also in the results of the Time Study group which you set out on page 10. I am sure that your Institutions are doing a great service to industry in bringing forward these questions for general study."

The Director of the British Institute of Management said that the B.I.M. were also carrying on certain studies in the same field. Though the two bodies were at present working on different lines, it might be desirable to maintain close touch in the future.

An interesting letter has been received from Mr. M. Berry, the Chairman of the Institute of Industrial Technicians, from which the following is a quotation : " The Institute of Industrial Technicians, the professional time study body of which I have the honour to be Chairman, are fully alive to the need (for a national Time Study training scheme), and most anxious to do what they can to help." He also comments that there is a scarcity of time study teachers, as their salaries compare so unfavourably with the salary they can earn in industry.

The January issue of the *Time Study Engineer*, the official organ of the Institute of Industrial Technicians, accepts the criticism of existing standards made in the Report, and states that unless steps are taken to improve consistency, the practice of Time Study may fall into disrepute. The I.I.T. advocate setting up a Committee to draw up a plan for bringing about consistency in rating. This plan should be publicised, and all recognised Time Study men should agree to implement it. The support and co-operation of the Institute of Industrial Technicians will be of the greatest value to the Joint Committee in their efforts.

Professor T. U. Matthew, Ph.D., M.Sc., M.I.P.E. (now a member of the Joint Committee), of the University of Birmingham, is carrying out research into work measurement, the main objectives being to investigate, with the co-operation of industrial firms and production engineers, the existing standards of consistency and accuracy obtaining in time study rating practice, and to establish methods of work measurement which will enable the work content of industrial operations to be determined on a more precise basis than hitherto. Professor Matthew and the Research Unit of the University of Birmingham are now collaborating with the Joint Committee and its Sub-Committee on Time Study, and intend to extend investigations into selected concerns in widely varied industries.

The I.C.W.A. members of the Committee are forming a sub-committee to carry out further investigations to define what costs should be included in Column 9 of Appendix B of the Report, in order that some progress might be made in endeavouring to arrive at a cost efficiency standard to enable a direct comparison of productivity to be made between firms. It will be recalled from the Report (paragraph 19) that the initial attempt did not provide sufficient data for even a tentative comparison to be made. This sub-committee will also make plans for a survey of machine utilisation in various industries and firms, and endeavour to prepare data which can be used by the respective managements on their own account.

REPORT OF THE ANNUAL GENERAL MEETING

Thursday, 26th January, 1950

The Twenty-eighth Annual General Meeting of the Institution was held on Thursday, January 26th, 1950, at 4.0 p.m., at the headquarters of the Institution, 36 Portman Square, London, W.1. The President of the Institution, Dr. Herbert Schofield, C.B.E., was in the Chair.

NOTICE CONVENING MEETING The Director and General Secretary (Major C. B. Thorne, M.C.) read the notice convening the meeting.

MINUTES OF PREVIOUS ANNUAL GENERAL MEETING The Minutes of the previous Annual General Meeting, which had been published in the Journal for December, 1948, were, on the motion of Mr. J. E. Attwood, seconded by Mr. T. A. Westall, taken as read, confirmed, and signed.

ELECTION OF MEMBERS OF COUNCIL The Director and General Secretary read the list of members of Council for 1949–50, as at 1st July, 1949.

ANNUAL REPORT OF THE COUNCIL AND PRESENTATION OF STATEMENT OF INCOME & EXPENDITURE, BALANCE SHEET, AND AUDITORS' REPORT The Chairman of Council (Mr. J. E. Hill) presented the Annual Report of the Council and the Statement of Income and Expenditure, Balance Sheet and Auditors' Report for the year ended 30th June, 1949, which had been published in the January, 1950, Journal, and moved their adoption.

He said:

"On behalf of your Council I have very great pleasure in presenting the following report for the year 1948-49.

"The Institution has made more progress in the past year than in any previous year of its history. Not only has it become involved in activities which bring to it more authoritative recognition, but it has continued to expand its numerical strength.

"Your Council, however, are most anxious that the Institution encourages qualified individuals, who are engaged in the control of production outside the narrow limits of the engineering industry, to join its ranks. It is realised that it is only by this broadening of its base that the Institution can exercise a beneficial influence on the productive efficiency of the country as a whole.

" At the same time, the highest standards of membership are being maintained and an Associate Membership examination has been approved by your Council to come into effect in September, 1950.

FIRST NATIONAL CONVENTION, BOURNEMOUTH

" The Institution held its first National Convention in Bournemouth on the 23rd, 24th and 25th September, 1948. Over 500 members, their wives and visitors attended the Convention and the very interesting programme which had been arranged and the glorious weather which prevailed, contributed largely to the success of this event.

" The main addresses were given by General Sir Bernard Paget, G.C.B., D.S.O., M.C., on " Leadership " ; Lt.-General Sir Ronald Weeks, K.C.B., C.B.E., D.S.O., M.C., T.D., on " Britain's Industrial Future " ; the President of the Institution, Dr. H. Schofield, C.B.E., B.Sc.(Lond.), A.R.C.Sc.(Lond.), D.I.C., M.I.Mech.E., M.I.Struct.E., A.M.I.C.E., A.M.I.E.E., F.Inst.P., F.I.I.A., and Mr. E. W. Hancock, M.B.E., on " Britain's Industrial Problems."

" Four Discussion Groups were also organised—the first on " Production Engineering and Engineering Production " ; the second on " Speculation and Enterprise as Factors in Planning for Repetitive Production " ; the third on " Youth in Engineering and Youth in Industry " and the fourth on " The Economics of Quality and Accuracy," all of which were very well attended.

" The main sessions were held in the Town Hall and the Pavilion, and the Institution is very grateful to the Mayor and Corporation for the very warm welcome and generous hospitality which was extended to us on this memorable and enjoyable occasion.

" As a result of a telegram sent to H.M. Government from the Bournemouth Convention, the Institution was asked to submit concrete proposals to H.M. Government to indicate in what way the Institution could be of service in the improvement of national productivity. A memorandum was drawn up on Increasing National Productivity and submitted to H.M. Government on 13th December, 1948. The Memorandum contained proposals for the establishment of Development Panels throughout the country, with the object of assisting the smaller firms to improve their productivity. The scheme, however, was rejected on the grounds that it would not be likely to command such general support as would warrant a grant from public funds to finance it.

ANGLO-AMERICA COUNCIL ON PRODUCTIVITY

Specialist Team on Materials Handling. " Representatives of the Institution were invited to attend a conference in London on June 9th, 1949, in order to discuss a recommendation, which had been made by the U.K. Section, that the Institution of Production Engineers should be represented on the first Specialist Team to visit the U.S.A.

"It was decided that the team should be made up of 12 representatives—two from the Institution of Mechanical Engineers, two from the Institution of Electrical Engineers, two from the Institution of Production Engineers; three from the Trade Associations concerned with the production of equipment; one from the Engineering and Allied Employers' National Federation, and two from the T.U.C.

"The objectives of the Team were provisionally defined as follows:—

(*a*) To study the extent of application of mechanical aids in the factory and their effect on costs; better use of skill; fatigue and similar problems.

(*b*) To obtain particulars of varying classes of device in common use in the United States; to consider the practicability of their application in the U.K. conditions, and to disclose the chief gaps in availabilities in the U.K.

(*c*) To prepare a report which can assist British industry in developing the use of mechanical aids in the factory.

"The U.K. Section of the Anglo-American Council on Productivity agreed at its meeting that the question of leadership in encouraging operatives to make more use of mechanical aids was perhaps more important than the availability of equipment.

"After a further meeting it was decided that Mr. W. M. Hiorns, Chief Materials Handling Engineer, Humber Ltd., and Mr. W. J. Dimmock, Assistant Works Manager, Hoover Ltd., should be the Institution's representatives and that the latter should be Secretary of the Team. The Team left for the U.S.A. in September, 1949.

FUEL ECONOMY "In December, 1948, the Institution published a Memorandum on "Methods Employed to Achieve Economy in the Use of Fuel." This Report was a result of a survey carried out by the Institution in collaboration with affiliated firms, with the object of ascertaining the effect on productivity of various methods employed to reduce consumption of fuel and power.

DIRECTOR AND GENERAL SECRETARY "On March 5th the Director & General Secretary, Major C. B. Thorne, M.C., conveyed to the President of the Institution that he had been invited to become the prospective Conservative candidate for the Uxbridge Division and offered to resign his appointment as Chief Executive Officer. Council decided, however, in order to retain continuity, that Major Thorne should be asked to continue his service with the Institution until the General Election, when the position would again be reviewed.

ARTICLES OF ASSOCIATION

"At an Extraordinary General Meeting of the Institution on April 28th, 1949, revised Articles of Association were adopted.

RESEARCH - MEASUREMENT OF PRODUCTIVITY

"The Institution's Research Committee have begun their programme of operational research by launching an investigation into the measurement of productivity. On 5th November, 1948, a Joint Conference was held with the Institute of Cost & Works Accountants at the Royal Empire Society, London, on "The Measurement of Productive Efficiency." Amongst many distinguished guests present were the United States Commercial Attaché, Mr. Basil Dahl, Sir Leonard Browett, Director-General of the National Union of Manufacturers, and Dr. Alexander King, of the Lord President's Committee on Industrial Productivity. The Conference was attended by approximately 400 representatives of the two Institutions from all parts of the United Kingdom and aroused considerable interest in both the national and technical Press.

"As a result of the Conference the two Institutions set up a Joint Committee on the Measurement of Productivity, whose terms of reference were to devise means of measuring productivity, and also means of applying the technique of measurement for the purpose of improving productivity. This Committee have secured the co-operation of a number of prominent industrial organisations in the London area and have made an experimental study of measurement by process in the automatic departments of the companies concerned.

"The Committee are also carrying out research into methods of Time Study, as the preliminary investigation has shown that there are great variations in the practice of Time Study in different companies, due to the lack of a uniform curriculum for this subject in Technical Colleges. The Joint Committee are now extending their work over a wide area, and are collaborating on this aspect of their research with the Work Measurement Research Unit headed by Professor T. U. Matthew at the University of Birmingham.

"Liaison with the Anglo-American Council on Productivity is being maintained.

HAZLETON MEMORIAL LIBRARY

"It has been decided that the Institution's library, which was totally destroyed by fire during the war, should be re-established and be known as the "Hazleton Memorial Library" in recognition of the great services rendered to the Institution by the late Mr. Richard Hazleton, the Institution's first General Secretary.

"A room at Headquarters has been furnished for use as a library and a special Committee have done a great deal of valuable work

in preparing a classification of books which are considered to be essential. In view of the fact that the library will be of considerable value to Graduates and Students, a number of Graduate members were co-opted to this Committee.

"An appeal to all members to donate books will be launched during the coming year and a specially designed name plate in each volume will give acknowledgment to the donor. Not only will the library be maintained at Headquarters for direct reference by members, but it is intended to introduce facilities to enable the library to be used as a postal lending library and to establish an Intelligence Service for the collation of all the most up-to-date information on matters of interest to Production Engineers.

SECTION ACTIVITIES

(a) NEW SECTIONS.

(i) *Bombay Section.*—"The formation of the Bombay Section, the second branch of the Institution in India, was enthusiastically received at its Inaugural Meeting on 30th May, 1949. The rapid growth of industry in this part of India has given the Institution this opportunity of extending its facilities to a wider field.

(ii) *Dundee Section.*—"In view of the fact that new industries have been established in the Dundee area there is every prospect of a flourishing Section being developed.

(iii) *New Zealand Section.*—"The inauguration of a Section in Auckland is of particular interest as this is the first branch of the Institution to be formed in the Dominion of New Zealand.

(b) UNITED KINGDOM ACTIVITIES.

"During the 1948-49 session, very full and interesting lecture meetings were conducted and a number of works visits were arranged by some Sections. In addition, a number of Sections organised very successful social functions, among which was the Liverpool Section Inaugural Dinner. The Guest of Honour on this occasion was the Rt. Hon. Harold Wilson, P.C., M.P., President of the Board of Trade.

"General development within the Sections has been excellent, and much hard work has been carried out by the Section Committees behind the scenes. The membership of each individual Section has increased during the past year.

"Mr. F. W. Cranmer, has resigned from the office of Honorary Secretary of the Manchester Section after ten and a half years service. He has been a great worker both for the Institution and his Section, and Council have expressed their appreciation of his services. His interest in the Institution is still maintained, however, as he is a member of Council and also serves on the National Membership Committee.

"A Conference of Section Honorary Secretaries of the Institution was held at Birmingham on 25th May, 1949, and the attendance numbered 22. Mr. A. J. Mansell, Honorary Secretary of the Birmingham Section, took the Chair. These Conferences are found to be very valuable both from the point of view of administration and the personal contacts which are made.

(c) SECTIONS OUTSIDE THE U.K.

(i) *Australia.*—" The work of the Institution in Australia is progressing very vigorously, the membership at present being almost 400. The expansion of the Institution's affairs there has made it necessary to employ professional assistance to relieve the Honorary Officers of a great deal of the routine administrative work.

" The two Sections at Melbourne and Sydney have very full and interesting programmes of lectures and works visits. It is hoped to form a further Section in Adelaide in the near future.

(ii) *New Zealand.*—"The recent war brought Institution developments in New Zealand to a temporary standstill, but interest has now been revived and a Section has been established in Auckland.

" It has not been possible so far to arrange for the presentation of any papers, but the Committee are drawing up a programme which it intends to put into effect early in 1950.

(iii) *India.*—" Much valuable work has been carried out in India during the past year and many successful lecture meetings have been held. The Bombay Section is now firmly established, and reports indicate that both the Calcutta and Bombay Sections are playing a prominent part in the engineering life of India. It is anticipated that a Sub-Council will be formed on similar lines to Australia and South Africa, in order to co-ordinate the work of the two Sections, and to provide facilities for the formation of other Sections within the Republic.

(iv) *South Africa.*—" Considerable progress has been made and there has been a steady growth in membership. Many interesting lectures and works visits have been held and these were well attended.

INSTITUTION AWARDS 1948-9

(a) LORD AUSTIN PRIZE

"This prize was awarded to Mr. A. V. Knight, for his essay on " Mechanical Handling."

(b) HUTCHINSON MEMORIAL AWARD

" This award was made to Mr. A. Short, for his paper on "The Commercial Possibilities of the Lost Wax Process."

(c) INSTITUTION MEDALS

"The Medals for the best papers read to the Institution during 1948-49 have been awarded as follows :—

For the Best Paper by a member: Mr. A. Short, for his paper on "The Commercial Possibilities of the Lost Wax Process."

"This is the third award made to Mr. Short in the past two years and I should like to extend to him the Institution's congratulations on his continued success.

For the Best Paper by a non-member: Mr. H. Richards (Marshall Richards & Co., Durham), for his paper on "Wire Drawing."

"The awards were made at a meeting of the London Section held on May 19th, 1949, and were presented by Dr. H. Schofield, C.B.E., President of the Institution. An informal dinner party was held before the Meeting at which the Section President, Mr. F. P. Laurens, O.B.E., M.I.Mech.E., welcomed on behalf of the London Section, the President, Members of Council, Section Presidents and Mr. H. le Cheminant, a Member of the Australian Sub-Council.

GRADUATESHIP EXAMINATION 1949 "Of the 154 candidates who sat for the Graduateship Examination this year, 120 passed and 22 failed ; 12 candidates were referred in one subject. These figures show a considerable increase on those of last year, and the number of entries and passes is the highest in the history of the examination.

STANDARDISATION "The Standards Committee have been actively continuing their work, and during the past year have been instrumental in selecting and appointing many members of the Institution to serve on B.S.I. Technical Committees. At the request of the Ministry of Supply a Memorandum was submitted to the Lemon Committee in February, 1949, on "Standardisation of Engineering Products" and a representative of the Standards Committee was subsequently interviewed on the subject. Draft Specifications have been circulated to Committee members and selected panels of members and many useful comments and suggestions have been forwarded to B.S.I. A survey of the questionnaire on Interference Fits was prepared by Glasgow University, and at a subsequent meeting of the B.S.I. Committee MEE/26 a programme of research work on this subject was drawn up. The Standards Committee have prepared a summary of comments on the revision of Tolerances for Ball and Roller Bearings, and this has been submitted to B.S.I. A number of suggestions for standardisation have been received from members, examined by the Standards Committee and passed to B.S.I.

MEMBERSHIP STATISTICS "There has been a net increase of 598 members during the year. The total number of members at 30th June, 1949, was 7,885, made up as follows :—

Honorary Members	6
Members	1,304
Associate Members	2,637
Int. Associate Members	1,393
Associates	155
Graduates	1,377
Students	812
Affiliated Firms	201
Total ...	7,885

FINANCE

"The Balance Sheet and Statement of Income and Expenditure will be found between pages 14 and 19 of the January, 1950, Journal.

"In accordance with the requirements of the Companies Act, 1948, the accounts of our Sub-Councils in Australia and South Africa and of the Calcutta Section have been amalgamated.

"The steady rise in the cost of living index over the past few years has had a very serious effect upon Institution finances. In my report to members at the last Annual General Meeting, I drew attention to the fact that the rates of subscription were too low to meet the inflationary trend of the nation. I forecast then that consideration would have to be given to the possibility of increasing the rates, particularly in view of the serious disparity between the number of corporate members and junior members. The membership figures which I have already quoted illustrate the fact that the heavy proportion of Juniors imposes a serious strain on our finances, as their rates of subscription do not in any way cover the cost to the Institution of maintaining their membership. Clearly, the Juniors must be subsidised by the Seniors to a certain extent in the interests of the future.

"It was realised by Council two or three years ago that the prevailing rates of subscription were too low to meet the increasing costs of maintaining the Institution, but Council refrained from making any increase in order to comply with the appeal to the country by the Chancellor of the Exchequer to avoid the introduction of any measures which would have an inflationary effect. However, the gap between the subscription income and the cost of maintaining the Institution under present day conditions became so wide that Council recommended increases in the rates of subscription, to take effect from 1st July, 1949, which were adopted at the Extraordinary General Meeting held on 28th April, 1949. The revised scale of subscriptions is as follows :—

	£	s.	d.
Members	5	5	0
Associate Members	4	4	0
Int. Associate Members	3	3	0
Associates	4	4	0
Graduates	2	12	6
Students	1	1	0
Affiliated Firms (no change)	10	10	0
Life Membership ... 40 guineas			

"In deciding upon the new rates, Council took into account not only the need to balance the Institution's budget, but the necessity to provide adequate funds for expansion of the Institution's work in the future. The Principal Officers have made a thorough investigation into the whole of the administration and are more than satisfied that our Headquarters are maintaining a very high level of efficiency. Any major economy in the cost of administering the Institution could only result in a serious curtailment of the effectiveness of Headquarters. In addition, economies would involve the contraction rather than the expansion of the Institution's activities.

"Your Principal Officers are satisfied that the Headquarters organisation of your Institution has been developed in a way which will enable it to expand in the most economical manner as the Institution grows.

P.E.R.A. "The following members were elected to represent the Institution on the Council of the Production Engineering Research Association of Great Britain for the year 1949 :—

Sir Lionel Kearns, C.B.E. (Chairman)
Dr. H. Schofield, C.B.E.
Mr. E. J. H. Jones, M.B.E.
Mr. A. L. Stuchbery
Mr. F. P. Laurens, O.B.E.

ELECTION OF TRUSTEE "Council have elected Dr. Herbert Schofield, C.B.E., a Trustee of the Institution in the place of the late Mr. J. G. Young.

YATELEY TEXTILE PRINTERS "On 3rd November, 1948, the Institution's Headquarters were made available for an exhibition of the work of the Yateley Textile Printers, an organisation for the training and employment of women and girls disabled by infantile paralysis. The exhibition, which was opened by Lady Georgina Coleridge, and attended by Mrs. Winston Churchill, was very

successful and members will no doubt feel that by affording accommodation for this purpose the Institution has supported a very worthy cause.

HONOURS "The Institution has pleasure in recording that His Majesty the King has conferred the award of O.B.E. on Mr. J. A. T. Dickinson, and Mr. Horace Turner, and the award of M.B.E. on Mr. William Buchanan.

OBITUARY "The deaths of the following members are recorded with great regret :—

Mr. R. B. Allen	Mr. N. Midgley
Mr. F. R. Augier	Mr. A. McNab
Mr. Philip Bevan	Mr. L. T. Mockeradge
Mr. G. Campbell	Mr. J. L. Munn
Mr. John Clare	Mr. T. S. G. Neville
Mr. F. P. Donovan, M.B.E.	Mr. A. E. Parker
Mr. J. Eccles	Mr. W. J. Parslow
Mr. W. H. Fidler	Mr. E. P. Paxman
Mr. B. W. Gray	Mr. A. J. P. Soar
Mr. N. Greenhalgh	Mr. A. P. Welch
Mr. H. G. Lee	Mr. T. White
Mr. P. Lethlean	Mr. J. R. Woodall

"I have great pleasure in formally moving the adoption of this Report, together with the Statement of Income and Expenditure, Balance Sheet and Auditors' Report, for the year ending 30th June, 1949."

The Vice-Chairman of Council (Mr. Walter C. Puckey) seconded the motion.

The President congratulated the Chairman of Council on an excellent Report and put the motion for the adoption of the Report and Accounts, which was carried.

Mr. G. H. Hales, in commenting on the Accounts, expressed the hope that the recent increase in the rates of subscription would put the Institution's finances on a sound footing and appealed to the Council and the Finance and General Purposes Committee to avoid all unnecessary expenditure so that the Institution's financial position could be strengthened in the shortest possible time. The President assured Mr. Hales that the Finance and General Purposes Committee had always kept a very vigilant watch on the financial position, and would continue to do so.

AMENDMENTS TO ARTICLES OF ASSOCIATION The Chairman of Council moved the adoption of the amendments to the Articles of Association as set out on pages 19 and 20 of the Journal for January, 1950.

Mr. W. Core seconded the motion.

Mr. C. Toeman moved, as an amendment, that the proposed amendments to Articles 46, 49 and 73 be rejected and that the title of the Chief Executive Officer should continue to be Director and General Secretary, which, in his view, was more in keeping with the Institution's progressive outlook.

As the amendment failed to find a seconder, the President put the original resolution to the meeting. The Resolution was carried.

ELECTION OF AUDITORS On the motion of Mr. E. J. H. Jones, M.B.E., seconded by Mr. R. S. Brown, Messrs. Gibson, Appleby & Co., Chartered Accountants, of Aldwych House, London, W.C.2, were re-elected Auditors to the Institution, for the year 1949-50. The President thanked the Auditors for their services during the year.

ELECTION OF SOLICITORS On the motion of Mr. A. S. Johnstone, seconded by Mr. F. P. Laurens, O.B.E., Messrs. Syrett & Sons, Solicitors, of John Street, Bedford Row, London, W.C.1, were re-elected Solicitors to the Institution, for the year 1949-50. The President thanked the Solicitors for their services during the year.

VOTES OF THANKS Mr. H. Burke proposed a vote of thanks to the President of the Institution, the Chairman of Council and the Principal Officers. The members of the Institution would always be grateful to the President for the work which he had done for the Institution during his years of office ; work which had been greatly distinguished. Mr. Hill, the Chairman of Council, had presented a most able report and had rendered magnificent service during his Chairmanship. Mr. Puckey, the Vice-Chairman of Council, had given the Institution the benefit of his wisdom, time and energy as Chairman of several Committees, and they looked forward to seeing much more of him in the future and thanked him for what he had done for the Institution. Thanks were also due to the Chairmen of the Standing Committees, whose work was of the greatest importance in carrying out the policy of the Institution.

Mr. E. J. H. Jones, M.B.E., seconded the resolution, which was put by Mr. Burke and carried unanimously, with acclamation.

The President said, on behalf of his colleagues, that he greatly appreciated the remarks which had been made and the way which they had been supported by the meeting. He personally would like to move a vote of thanks to the Section Honorary Secretaries, who did a great amount of work for the Institution in a quiet and unobtrusive way. He would like to couple with the vote of thanks, the permanent staff of the Institution, for their excellent services during the year.

The vote of thanks was carried unanimously, with acclamation.

The President thanked the members present for their attendance, and the proceedings then terminated.

TRAINING OF TECHNICIANS FOR INDUSTRY

by R. A. P. MISRA, A.F.R.Ae.S., A.M.I.Prod.E.

Synopsis of paper presented to the Bombay Section of the Institution, August 12th, 1949

In presenting his paper Mr. Misra outlined some of the difficulties peculiar to the training of personnel for Indian industry, and suggested remedies which he considered demanded a high priority.

It was stated that the expansion of Indian industry was severely handicapped through the shortage of trained personnel, and there was a feeling that in the past there had been a tendency to concentrate attention on the contribution of the technical supervisory staff without due recognition of the part played by the skilled industrial worker.

The paper stressed the need for all organisations to introduce organised apprentice training, and to foster relations which would reduce labour turnover. The adoption of the English language was considered essential as the medium of instruction, as it gave access to a large volume of technical and scientific information.

An important comment concerned the need for a balanced approach with equal emphasis on craftsmanship and supervision, and on design and administration.

POSSIBILITY OF EXPANSION

After giving details of typical schemes and comparing the effectiveness of different forms of study, Mr. Misra emphasised the need for a recognition of the problem at the highest levels, and showed the enormous possibilities for expansion of industry in India.

Whilst all contributors to the discussion did not agree with the speaker, there was considerable agreement concerning the difficulties to be met, particularly with regard to the encouragement of personal effort, and the acquirement of skill. The need for establishing recognised agreements between apprentices and employers appeared outstanding, but it was emphasised that this would not replace good industrial relations developed through satisfactory working conditions.

For those interested in the specific problems of training in India, the full text of Mr. Misra's paper is available in the Institution Library.

The Institution of Production Engineers does not accept responsibility for any statements made or opinions expressed in any papers published in the Journal of the Institution.

VALID INCENTIVES

by E. C. Gordon England, F.R.Ae.S., M.I.E.E., M.I.Prod.E., F.I.I.A.

Presented to the S. Wales and Monmouthshire Section of the Institution, at Cardiff, 30th November, 1949.

On all sides we hear that our country is faced with an economic crisis never before equalled in its long and exciting history.

The magnitude of our economic emergency is, in any event, of such an order that only the maximum and sustained effort of each and all of us, to increase useful production through greater productivity, will suffice to meet the need and overcome the danger with which we are faced.

If we do not succeed in achieving new high levels in effective production per man hour in almost every walk of life, if we do not achieve that soon, no Marshall Aid, no political nostrums, no constant repetition of ideological creeds, and no attempts to apply them will prevent us from experiencing economic disaster and subsequent want and distress.

How are we to set about the gigantic task which besets us? It is a most formidable undertaking—let us make no mistake about that. This is no short term effort, but one that has to be sustained, so far as can be seen, in perpetuity.

In the first place we must be prepared to cast aside the dross of years of wrong thinking, itself the outcome of misguided propaganda and emotionalism expressed in easily memorised clichés. We must challenge and examine critically practices which have no better foundation than political expediency, and which are economic fallacies.

Such ideas as a shortage of man-power, in a community of many millions of people, is an economic fallacy. Equally fallacious is the statement that we make things in industry. Industry is one of the groups of conversion processes which converts raw materials into something capable of being used by the ultimate consumer. We *make* nothing.

We have failed to recognise that " people " are the dominant factor in every phase of industry, and that service to " people " is the true objective of all our industrial efforts. People matter, and people alone.

Too many of us have made the mistake of believing that technique and mechanisation are an end rather than the means to an end. We are too prone to complain about the present state of mind of the worker. The lack of responsibility, absence of a sense of duty, disloyalty, and avoidance of work which is so widespread today in

industry is not cause, but effect. We are reaping the results of many years of managerial mistakes.

THE BUSINESS OF REGENERATION My purpose this evening is to try and persuade you that, by vision and the exercise of patient and intelligent management we can, once more, bring to the fore the high qualities and sterling character with which the people of this land have been so generously endowed by Providence. Those of us responsible for any function of management in the realm of production have a great part to play in the exciting time ahead. We are on the threshold of great opportunities, for we are starting on the business of regeneration.

Many years ago I was privileged to read a paper before the Institution of Production Engineers in London, under the title of "The Conservation of the Human Element in Industry." The Chairman, Sir Alfred Herbert, at that time was good enough to say, in closing the meeting, that my paper dealt with a subject of fundamental importance to the Institution, and one which should have a profound effect upon its future line of action. This paper is the logical sequence to my earlier paper.

Needless to say, that early paper suffered the fate of most pioneering efforts; its theme has been ignored or discredited as rather idealistic nonsense.

UNCOMMON COMMONSENSE We are told, with considerable truth I believe, that the most uncommon thing is "commonsense." Why should this be? Is it not because "commonsense" can only survive where an open mind exists? We production engineers and administrators should be eager to express, at all times, "the open mind," for the core of good management is the application of cold, logical, factual thinking or "commonsense" to every situation, without bias of any kind.

THE PRINCIPLES OF PRODUCTION In an endeavour to assist war production, and to dissipate ignorance in high places, I conceived a list of rules governing all production activities which, so far as I know, has never been challenged.

This list was first given the light of day in 1940, in a publication called "A Plan for War Production," which was very widely circulated in Parliamentary and Government circles and throughout industry by its publishers, the Engineering Industries Association, of which at that time I had the honour to be Chairman. These Principles and Rules are set out below, just as then published:

(1) The process of production in the engineering industry is not some kind of mystery, but depends in the main upon principles as well-defined as those of mathematics.

(2) The human factor is dominant, and this must be taken into consideration at every step. Ideal working conditions for those employed in industry are inseparable from real production efficiency.

(3) The quality of management is more important than the quality of factories, equipment and machines.

(4) A plan of production, and its orderly observance in action, is essential.

(5) For any product, the correct measure of efficiency is manhour per unit of production per h.p. employed per sq. ft. of space employed. (To arrive at the manhour, all employed in a concern must be included in the total manhours available.) Efficiency cannot be measured by a low rate of overhead in relation to direct costs for labour and materials, as Government departments seem to think.

(6) Nothing must ever be done by hand which can be performed by the correct application of power-driven machinery. To conserve manhours (the only real wealth), there must be a constant movement to raise the h.p. available per worker and the value of machine tools per worker.

(7) There is a " cycle of production " for every type and class of production.

(8) There is a " time span " for every " cycle of production." Its length depends on the product and the overall efficiency in the factory to which it relates.

(9) Any failure to recognise the paramount importance of the " cycle of production " and the " time span " must result in failure to maintain continuity in production flow, and lost output can never be recovered.

(10) Factory space, equipment, tools and materials required in the process of production must be available at the planned time ; any failure means a breakdown in the rhythm of production.

(11) Time lost in a failure to maintain the rhythm can never be recovered. This is why discontinuity of orders is such a serious factor in limiting production.

(12) Time lost due to failure of planning, lack of materials, and/or the necessary manhours is irrecoverable.

(13) The " area " of production includes man, materials, machines, power, factories and transport.

(14) Every essential process in production is of equal importance.

(15) Every part, big or small, is of equal importance in any production plan.

(16) Movement is the dominant process and cost of all production.

(17) Perfect timing is the key to effortless and efficient production.

(18) The progressive elimination of all non-essential human physical effort in production, and its conservation for directive or control purposes, is essential for efficiency in production.

(19) " Knowing how " is ever important in all production, so constant education of all engaged in production is essential.

(20) System or organisation is a tool of production, and the better the system the keener the tool ; the keener the tool, the more experienced and trained has to be the individual using it.

THE BASIS OF THE CASE For our purpose this evening we need only consider the second, third, eighteenth and nineteenth points. Of these, the second and the third are the two upon which rest the whole structure of all good production engineering. It is upon these that I rest the case made in this paper.

In March, 1947, the Wolverhampton Section of the Institution of Production Engineers held a National Productive Efficiency Conference. Several outstanding papers were given and discussed at that Conference. I think a great contribution was made to the sum of the available knowledge in this country by the publication in full of these proceedings.

Mr. Lewis C. Ord's paper on that occasion contained this most challenging statement. He said :—

" Your production of real wealth today per head of the entire population is down to about the 1913 level. Yet how many people are aware of the fact or of the reason ?

" By the end of 1947 the average production of real wealth per head in this country is not likely to be higher than half the American level. Given the time I could satisfy you that there is no reason why you should not produce as much real wealth per head as the Yanks. The balance of industrial advantage is yours. Your handicaps are almost wholly of your own making. Is it not time that a body like yours made a determined effort to get to the bottom of this problem ? "

In the discussion that followed no one took up this challenge. Why ? If it is true, it becomes a just and most devastating criticism of our production engineers and managers if the right solution to the problem is not relentlessly pursued (to the complete exclusion of all lesser matters) until it is solved. Is " Management " making a determined effort to get to the bottom of the problem ?

SOME AWKWARD OBSERVATIONS Mr. Ord had several other awkward things to say :

" You have been in an industrial decline that has continued in an unbroken stretch for some 65 years. It will go lower if something

is not done to stop it. Nothing I have heard here or elsewhere in this country is capable of arresting that decline and starting a real recovery.

" Industry here seems always to attack the worker. That is not fair, and British management is largely to blame for this situation. Management has been the weak spot in British industry for the last 65 years. For all that time it has been growing steadily more elaborate and costly relative to American management."

These charges, too, went unanswered in the discussion, so far as the printed report goes. Yet here, in my view, are the major challenges with which we are faced if my two principles of production are as fundamental as I believe them to be. Clearly these remarks by Mr. Ord express a belief in the apparent failure of " Management " to give due prominence to the human element.

My proposition to you this evening is that we must recapture and act upon the thought that " the human element in production is the dominant factor." If we can do so, the expression of good management will be possible and should follow.

Small wonder that while these charges and challenges remain unanswered by " Management," there descends upon us from Parliament and the Ministries a spate of ill-considered ideas which threaten to engulf us. We have no right to complain of these " cloud cuckoo land " ideas flooding down upon us if we have failed to give a lead to those responsible for broad policy, and to direct the stream of their thoughts into sound and positive channels.

POLITICAL BLUNDERLAND

What is our answer to those who give expression to such contradictory propositions as :—

" The present day Government had to take a much larger part in industrial matters than our forefathers would have thought possible." (Mr. Oliver Lyttleton, M.P.)

" One thing no Government can do is to produce the goods ; that can be done only by the managements and the workers in our industries." (Sir Stafford Cripps, M.P.)

Apparently, increased production per manhour, according to Mr. Oliver Lyttleton, is to be achieved by having more and more of non-productive, uninformed and inexpert elements forced on industry. On the other hand, Sir Stafford Cripps seems to have learned something from Dean Jonathan Swift, who wrote, 220 years ago :—

" Whoever could make two ears of corn or two blades of grass grow upon a spot of ground where only one grew before, would deserve better of mankind and do more essential service to his country than the whole race of politicians put together."

Our forefathers who, by their courage and enterprise, made our nation wealthy, could not conceive the idea of the Government in

industry. These simple people were concerned with making all the goods and services likely to find market acceptance that they could, and at prices buyers could and would pay.

Governments will interfere in industry so long as management ignores the very powerful emotional desire of all people for recognition that the dominant factor in all industrial activity is—the human factor.

HUMAN NATURE DEFINED

We hear so much about human nature, how it acts, and how it never changes. Let me here give you my definition of human nature. It is " the impact of all of us on each and of each on all." If this be true (and I will welcome being challenged upon this statement), then one thing is certain—human nature is never constant but continually in a state of change. He will be a bold spirit who is prepared to dispute it, in the light of the grim experience of the years of war and in these subsequent uneasy years of peace.

Human nature, I suggest, is not an imponderable, as those who must create an alibi for our failures would have us believe. It is something that can be observed, calculated and predicted. One thing that seems to me abundantly clear is that its reactions are, invariably, consistent within a given set of circumstances.

To me, one of the oddities of human behaviour is the way people in management prove, to their own satisfaction, that workers and managers are different species, and that the law of the situation operates differently for each case. My observation is that this is preposterous nonsense. Let us admit the stark truth, that men and women in the same circumstances and environment act consistently to the same pattern. There are, in fact, no real " classes " ; we are all simply " folk," with a multitude of varying abilities. All are capable of making a useful contribution to society, but not the same contribution either in kind, quality, or quantity.

DEFECTIVE MANAGEMENT TECHNIQUE

We will not face that issue because to do so means our having to admit that our management technique of the last fifty years has been consistently wrong as far as its application to " people " is concerned. The present conception of management technique is wholeheartedly supported by the vested interests of Government, Employers' Associations, and the Trades Unions, but frequently for wholly different reasons.

Each of these vested interests, ever watchful, sends out an increasing cloud of propaganda. These clouds mingle, and the authors get caught up, no less than the general public, in the resultant fog of confusion. In the end we have the utterly ridiculous situation of each vested interest using the other's propaganda as the basis for further propaganda on behalf of its cause. Perhaps we " simple folk " in the Institution of Production

Engineers may be forgiven for failing to escape the inevitable results of getting caught up in a dense fog ! Let us, however, try to find our way to a clearer atmosphere by keeping close to the landmarks of principles.

Here perhaps I should give you my definition of management in what I believe to be its true sense. It is " the art and science of getting people to co-operate willingly in carrying out some joint activity to mutual benefit " and, may I add, " with the least expenditure of human effort." Does present day management measure up to that definition ? Presumably not, if Mr. Ord and most other people who speak and write on these matters are to be believed.

Are we using it in industry today ?

SEARCHING QUESTIONS Let us now examine the implications of my Principle No. 2, i.e. " the human factor is dominant in every phase of production." Consideration of this principle at once raises a number of very searching questions which seem to me to flow from this rule. I do not put them down in order of relative importance.

(1) Are the people in production sure of receiving justice from all grades of management ?

(2) Have they a sense of security in their industrial life ?

(3) Is every effort made to keep them fit ?

(4) Do the wages they receive ensure the enjoyment of a decent standard of life ?

(5) Are they convinced that they will be promoted if they have the ability ?

(6) Is the paramount incentive, i.e. " The desire to create " aroused ? Do they feel a sense of " the dignity of *man* " in the work they perform ?

(7) Does the character of the organisation engender in them a sense of duty, loyalty, and team spirit, and of their responsibility to the community ?

(8) Do the people in production realise that the enjoyment of the " rights of man " can only come about as the result of having fully discharged the obligation of " inescapable duties faithfully performed " ?

No doubt we all can add to that list, but it is already formidable enough. Most of us will register very low scores for credit when checking our present managerial activities against these questions.

It is because, in the past, our scores have been low that we find ourselves confronted by a whole host of vested interests which our operatives have created, over the years, to balance our sins of

commission and omission. It is these very vested interests that today bedevil the efforts of the production engineer and most other people in management.

A FANTASTIC SITUATION All over the country production engineers and managers, in their application of wage incentives, are today busily engaged, quite unconsciously, in erecting managerial obstructions in their own paths, then setting to work to climb over them. In this they are very ably assisted by the Employers' Organisations and the Trades Unions. No sooner do the production engineers and managers discover a means of surmounting one of these obstructions than they build up an even greater one in its place, only to devote their mental and physical energies to finding a means of getting over that, too.

This ridiculous performance is clearly demonstrated in the case of the operation of most so-called systems of " payment by result," or " wage incentives." These activities have become one huge folly, and were we not quite so conditioned by tradition and habit, the absurdity would become manifest to us.

The essence of good production practice is constant development, change and improvement. It is a law of production that there must always be progress or retreat. How, in these circumstances, can there be any honesty in making contracts with operatives calculated on the assumption of a stable basis for their operations, when the law of the situation demands, throughout the duration of that contract, a condition of the greatest possible flexibility and change if efficiency is to be maintained ?

It is significant that one reads, with some frequency nowadays, statements by spokesmen of the Government and industry, expressing deep concern that production per manhour for the nation as a whole has apparently reached its peak, and shows signs of a sustained decline.

Dr. H. Schofield, C.B.E., our President, said on 24th September, 1948, " Our workers are unwilling, for some reason or other, to give an hour's work for an hour's pay. We have got to tackle the problem of incentives which stares us in the face from every angle. I think myself that in this country our difficulties are human rather than mechanical."

INHERENT FAULTS My submission to you this evening is that systems of "payment by results" which include a measurement of personal output are an escape mechanism, used by production engineers and management to evade their full responsibility. They find it more agreeable to believe that the solution of our difficulties is to be found in the mechanical rather than the human field. It is the function of management to provide the operative, in an atmosphere of human dignity, with a continuous service of methods

machines and materials in such a form that increase in output is ever rising while human effort decreases.

Conversely, it is the function of the operative being provided with those amenities and services to make the best possible use of the opportunity provided.

During the course of my industrial career I have operated most known forms of " payment by result." From time to time I have favoured this or that variation, always with the hope that the inherent faults of the previous system would be avoided in the new ; but through them all run the same fundamental weaknesses.

They all create in those concerned in the operation of the system, vested interests in maintaining the job in its existing form, and invariably end in putting the operative and the production engineer on opposite sides of the game. The operatives and managers inevitably become opponents instead of allies. The conclusion I have reached, as a matter of principle, is that any form of " payment by result " involving measurement of output against wages paid gives the operative a vested interest in the job. This, I submit, is inherently undesirable and is inevitably against attaining the practical maximum efficiency in production.

In the limited time at my disposal I can only give a few illustrations of the evils which result from creating these vested interests.

Since the basis of all equitable contracts must be the expectation of stable conditions under which they can be carried through, every effort should be made to keep conditions constant. This is in direct and entire conflict with the objective of the Production Engineer, whose preoccupation is to keep every aspect of the production field fluid or in a state of movement. " Payment by result," as these words are generally understood, creates vested interests throughout the " cycle of production " : it greatly increases overheads in the form of rate fixers, time keepers, wages clerks, inspection staff, and all the great organisation that goes with them. It causes great resistance to change, and much time is spent in negotiations which should never arise. It puts an entirely wrong emphasis on the relationship of the operative to the job, and invites intellectual dishonesty. It greatly retards the speed with which new products and new or better methods can be introduced.

I have not exhausted the catalogue of errors that are inherent in most present day systems of " payment by result," but what I have listed are indeed formidable enough.

FAILURE TO ENSURE CO-OPERATION

I do not find in any of the popular systems of " payment by result " the effect in operation of engendering in the workpeople a permanently positive attitude to the job. There is no incentive to look for change, and no natural urge for the operative to seek the guidance

or help of the production engineer. There is no urge on the part of the operative to be on the alert for means of bringing about conditions of greater efficiency. The very nature of the contractual position tends to emphasise a supposed conflict of interests where there should be complete identity of objective among all concerned as members of a production team.

By and large, our whole complicated structure in connection with employment and the consequent systems of payment of people in industry has become an unsatisfactory business. An end will not be put to it until managers make it clear to all concerned, i.e. to the Government, employers, Trades Unions, and the workpeople, that disaster lies ahead if we travel further in the present direction, as Mr. Ord has so clearly pointed out to us.

It was my good fortune to attend in Oxford a Conference called by the Confederation of Management Association on the 25th September, 1947, at Queen's College. At that Conference we considered, over a period of three days, many aspects of the " incentive " or the " will to work."

There was general agreement that the best incentive was not represented by the pay packet, important though it was, but that the best incentive was an aggregate of a number of human emotions such as the urge to indulge in creative activity, pride in work, security, duties to family and health, the chance to get on, and the enjoyment of justice.

So mesmerised by the " pay packet " theory of incentive have all in industry and Government become that we cannot " see the wood for the trees." The pay packet is only a key by which man is enabled to unlock the cupboard containing the satisfaction of his desires.

If the pay packet " key," upon unlocking the door, does not give access to a cupboard loaded with good things, man's frustrations can become more important to him than the pay packet. That pay packet must give man the assurance of a fuller life or he will become increasingly dissatisfied, and no solution of the problem can be found by merely increasing the size of his earnings.

NEW SYSTEMS MUST BE EVOLVED

How do we escape from our predicament, and what is the alternative ? In my view it can quite clearly be stated. We must evolve systems of employment that satisfy the following requirements :

(1) The operative must have an active sense that his or her urge to take part in creative activity is being satisfied.

(2) Gives the workers in all grades a confidence that justice is being done.

(3) The workers must enjoy a sense of security.

(4) The workers should be conscious of the opportunity for advancement.

(5) A decent standard of living must be the experience of the worker.

(6) Create in all workers a sense of responsibility.

(7) Restore to management a freedom to manage, with the full authority and responsibility that this statement infers.

One of the most notable and experienced members of the Institution of Production Engineers said, on 24th September, 1948 : " I submit that it is not the problem of labour to manage business, but the duty of management to improve management " (E. W. Hancock, Director of Humber, Ltd.).

(8) The workers must be willing to do any job that management asks, secure in the knowledge that management will not mishandle the worker's best interests.

It is my view that too much cannot be made of the importance of the motive of the enduring impulse in most workers of a desire to be engaged in creative activity. This does not mean that the other incentives are unimportant, but that the enduring central incentive, in most human beings, is taking part in creative activity.

I believe industry has much with which to reproach itself because of its woeful failure to appreciate the profound importance of this imperative motive in all human affairs. Organisation is no substitute for the creative mind. Yet industry frequently acts as if it were. Organisation must ever remain the servant of the creative mind, or civilisation will perish.

IMPORTANCE OF SECURITY

Another important incentive is security. If it is held that I overrate this incentive, then I must ask you to examine your own reactions and motives. I think you will be forced to agree that, facing what you find in that introspec ion, you could not do justice to your important and exacting work unless you enjoyed relative security. Do not forget that to the operative his or her work is just as important and exacting, and the enjoyment of security therefore just as helpful in the accomplishment of good work.

You may say that these are beautiful thoughts outside the realm of practical politics. My answer is that enlightened pioneers in many parts of the world have shown that not only are these ideas practical politics, but also pay handsome dividends in building up financially strong organisations with good profits and a contented, devoted staff.

These enlightened pioneers have proved what most of us have failed to demonstrate—that ordinary folk are good, and that the reactions of folk are, in their experience, accurately portrayed by

my definition of human nature. It is often said that ordinary folk are so vicious that it is impossible to treat them in the mass as having high ideals, and an adequate sense of duty and responsibility.

I am frequently told, and expect to be told again, that these enlightened pioneers are nothing but starry-eyed idealists. My critics have tried to impress upon me that we must be " practical in a very practical world." I could not agree more with that sentiment, but the use of the word " practical " in this connection is invariably the harbinger of a diatribe from my critics on the evils of the workers and their incorrigible " human nature." It is a curious thing that a little discovery of the facts leads inevitably to the disclosure that my critics suffer from almost every kind of labour trouble in the course of their managerial experience. Frequently I find them to be either just entering upon, or emerging from, some new and unpleasant conflict with " human nature " !

NEED FOR A NEW PLAN My experience and the conclusions drawn from them impelled me to try and devise a plan for employment which would, by its inherent characteristics, avoid negative thinking on the part of all concerned with working out the " cycle of production." I had to try and focus the attention of the production team on the need to reduce the time span of any given " cycle of production," and make them keen to do so, while at the same time being eager to achieve an overall reduction of the manpower expended by the organisation on any and every job. Above all, any plan had to ensure the encouragement of team spirit.

As is the way with these problems, the solution emerged slowly, bit by bit. By the time a plan had formed in my mind I had the good fortune to be presented with an almost ideal set of circumstances on which to experiment.

The experiment has now operated for over three years, and so far its results are most encouraging from every point of view. It seems certain that we have succeeded in accomplishing the following :—

(1) We have re-established the right of management to manage with authority and responsibility.

(2) We have abolished all vested interests in any jobs being carried out in the factories.

(3) Costs have shown remarkable reductions and output has gone up to higher levels than were thought possible.

(4) There has been established a unity of interest between all grades of management and operatives.

(5) Flexibility has been established ; operatives are willing to transfer from job to job and occupation to occupation.

(6) The quality of the products steadily improves.

(7) There is a constant pressure from the operatives upon production management to improve methods and re-tool jobs and make savings, and for the introduction of new ideas and products.

(8) The team spirit and co-operation that has been created has been so remarkable that the disinterested observer invariably reports on the unique and very pleasant atmosphere in our factories.

(9) Absenteeism and sickness have been reduced to a level of 50 per cent less than the average of other works in the same area.

(10) There have been no disputes of any kind during the whole of the three years, in spite of the fact that both factories operating under the plan have been entirely reorganised as regards layout, methods and products during this period, to say nothing of the wholesale changing of jobs by operatives.

(11) The plan appears capable of standing up to lean times no less than to fat times.

EXPERIMENTING IN SMALL WORKS These experiments in new methods of handling people have been conducted in two small works, one in the London area, the other in Cumberland, and include a Sales Organisation with ten branch offices and stores covering the British Isles. The total employed was just over 500 when the scheme was started.

One of the most interesting and notable points is the fact that the management staff, the commercial staff, the salesmen, and the factory operatives all enjoy the same system of employment and pay. That is to say, their terms of engagement, holidays with pay, sickness benefit, pension rights, are all similar. Everybody has equal security of employment, all are on salaries—we have no hourly workers. The salesmen, after they were taken off commission, increased their turnover by 150 per cent.

When the scheme was introduced the Board made it a condition that it should be reviewed at the end of 12 months. In due course this was done. The staff had no changes to suggest, and the Board were satisfied to carry on the scheme with very minor adjustments, the outcome of experience which, with the agreement of all concerned, made for easier working.

In the last few months our business has experienced, in common with so many others, a slump in demand for our products. We have had to make drastic reductions in staff. This has taken place in an atmosphere of understanding and co-operation from all grades of the staff and workpeople which calls for the greatest respect and admiration.

THE NEW PLAN DESCRIBED By this time my audience may be anxious to have at least an outline of the employment plan which brought about these results. I am afraid you will find it disappointingly simple :

(1) We decided that what people wanted most was to feel they were engaged in creative work ; enjoy a practical measure of security ; have the opportunity to progress ; receive equitable treatment and recognition that they were *people*—not robots. We also decided that those employed in the business expected management to manage.

(2) We introduced a five-day week for all.

(3) It was made a condition of employment that everyone would be prepared to work on or be transferred to any job which, in the judgement of the management, was suitable for the skill or training of the individual concerned.

(4) The company pledged itself in return to do all in its power to give all its staff continuous and full employment.

(5) Everybody on the company's payroll was put on a salary basis.

(6) A scale of salary groups was introduced which was published to all employees. The lowest salary group was based on the cost of living, and provided that at the minimum end of the scale it would keep an adult in decency.

(7) No hourly rate or individual payment by result was permitted anywhere in the company's organisation.

(8) Everybody on the payroll was paid full salary whilst on holiday, both national and personal. Nobody had less than a fortnight's annual holiday.

(9) Sickness or accidents were fully provided for.

(10) A contributory pension scheme was introduced, the company purchasing back pension rights for its long service staff.

(11) A system of reviewing each employee's progress once in six months was introduced, the authority for granting all salary increases was restricted to the Board.

(12) An advisory body was created, representative of all salary groups, whose members were elected by secret ballot, to enquire into and obligated to report on any differences or difficulties that might arise between the management and the workers. It was called " The Panel."

(13) An output or sales " pool " was introduced, in which all salary groups shared in ratio to their salary.

(14) The whole scheme was submitted in writing to every employee and they were invited to take advice upon it and discuss it with friends outside the business. After a lapse of one week, mass meetings were held for discussion and questions. The scheme, on being put to the vote, was in every case unanimously approved.

ORGANISED JOINT CONSULTATION

We have no organised system of joint consultation and we do not favour it. Our view is that consultation is part of the day to day functioning of a good management. If people are not being continually informed and consulted, then management is at fault. Formal committees are just another vested interest and therefore against our principles. There seems no more validity in the demand that the practitioner in management should consult on a formal basis those managed, than that the doctor, dentist, author, artist, or playwright should consult those whom they serve upon the technique of their art or service.

I strongly suspect that all this urge for joint consultation is just another prop for those who have an uneasy feeling that the edifice they created is unstable on its foundations.

We are proud to say that our Panel has never met, and we all hope it will never need to. Everybody in the company has the right to invoke the Panel and bring a case before it, irrespective of their position in the company. We find throughout all ranks an unusual keenness to avoid building up difficulties and grievances. There is a strong sense that it is one of those things that " just is not done by decent people " to cause the Panel to meet.

SCOPE FOR THE PLAN

It is my view that there is little difficulty in introducing such a plan as I have outlined to most of the firms in British industry. Some system, such as I have described, should be capable of being introduced into any firm with less than 500 employees and one should expect it to be effective from its inception.

From the table following you will realise that the vast majority of organisations in manufacturing today are what may be fairly termed " small firms." This table was taken from the Ministry of Labour Gazette dated April, 1948.

	No. of Establishments
11—24 employees	15,640
25—49 ,, ...	12,730
50—99 ,, ...	9,710
100—249 ,, ...	7,810
250—499 ,, ...	2,920
500—999 ,, ...	1,330
1,000—1,999 ,, ...	590
2,000—4,999 ,, ...	250
5,000 or more ,, ...	60
Total with 11 or more employees ...	51,040

The following quotation from " The Economist," in the issue of 1st November, 1947, is perhaps appropriate as a comment at this point in my paper :

" The value to the community of having its economic decisions dispersed among a million heads, instead of concentrated on a hundred, has been vastly underrated."

I believe this to be true, and have said so time and time again over the last 15 years. At no time in our history has it been more important to be aware of the real structure of industry and to conduct our affairs in that state of awareness.

In the case of the very few large organisations employing many thousands, the adoption of a plan such as I have outlined may well present formidable difficulties at present, for there is much to be undone first, both on the side of the organised employers and the Trades Unions. These vested interests are formidable indeed, and the dissipation of their objections will present many a problem.

It is true that in most large organisations everything is impersonal, and human relations remote ; nevertheless, because the " machine " exists for " man," and not " man " for the " machine," we have got to pursue the correct solution and overtake it. The large organisation is not an end in itself, and if it fails to give people that sense of satisfaction that comes from taking part, consciously, in creative activity, it will have to be modified until it does.

The vested interests which thwart us must disappear ; they will go either through enlightenment, or through the pressure of great events. We managers cannot stand by with folded hands and inert minds while the pressure rises to bursting point.

PRODUCE OR PERISH

That these difficulties can and will be overcome I have no doubt. Their removal will benefit everybody, for during the next few years at least we either produce or perish.

I have said nothing this evening about methods, machines, and matters of that kind. In my view they are secondary conditions, very important in their right relationship to people, but subject to them. My concern has been with the foundation upon which all economic practice must rest, and to which all economic theory must be related—MAN.

I conclude with this quotation from an address which I had the honour to present to the Wolverhampton Production Exchange during the early part of the war, and which I hope you will agree has lost none of its point with the efflux of time :

" The present remedy for lagging production, the failure here and abroad, lies not in waiting for more supermen nor in the creation of grandiose schemes for ever stricter control. It lies, rather, in the creation of conditions under which the common multitude of small folk are permitted and encouraged to do their best. That may well prove to be the truth in post-war days, too.

" We engineers have a great responsibility and duty which we cannot escape. Let us demonstrate to the whole world that the British multitude of small folk do respond to enlightened management, and under inspired and sympathetic leadership are capable of a surprising and decisive ' best '."

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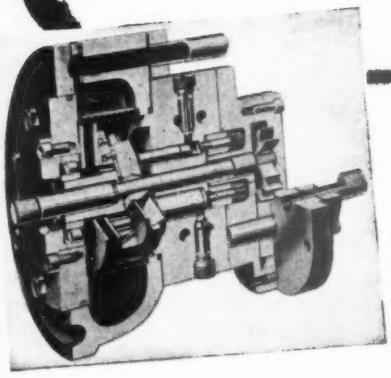
NEW FEATURES in HYDRAULIC PRESSURE PUMPS



● **SWASH-PLATE MECHANISM**

Movement between swash-plate and plungers is transmitted by direct contact instead of the usual connecting rods. Pure rolling contact, between swash-plate and the plunger ends is assured by providing a bevel gear between swash-plate and pump body. This geared swash-plate, in combination with the film lubricated thrust washers are unique features which enable the pump to be operated continuously at very high pressures without appreciable wear.

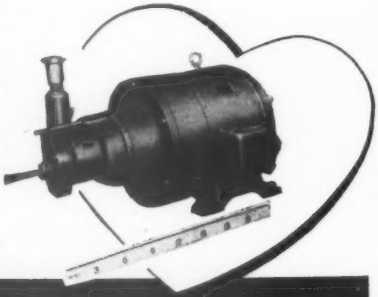
● **WEARINGLESS BEARINGS**

This entirely new type of axial plunger pump has no heavily loaded ball and roller bearings. The axial thrust in the swash-plate is taken by film lubricated thrust washers of novel design. Pumps have been operated at 14,000 p.s.i. *continuous* pressure for short periods and for 2,000 hours at 7,000 p.s.i. with no perceptible signs of wear.

97% VOLUMETRIC EFFICIENCY

ELECTRAULIC
REGD TRADE MARK

AXIAL PLUNGER PUMPS



The pump is the heart of the press

TOWLER BROTHERS (PATENTS) LTD. RODLEY, NR LEEDS

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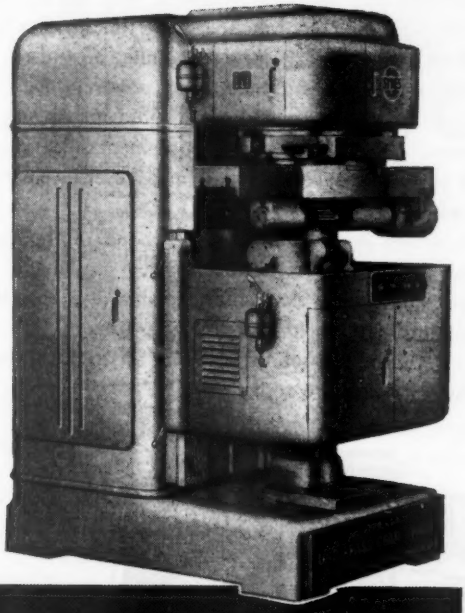
INTRODUCING

Gear Shaving Machines



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Specification and literature sent on request

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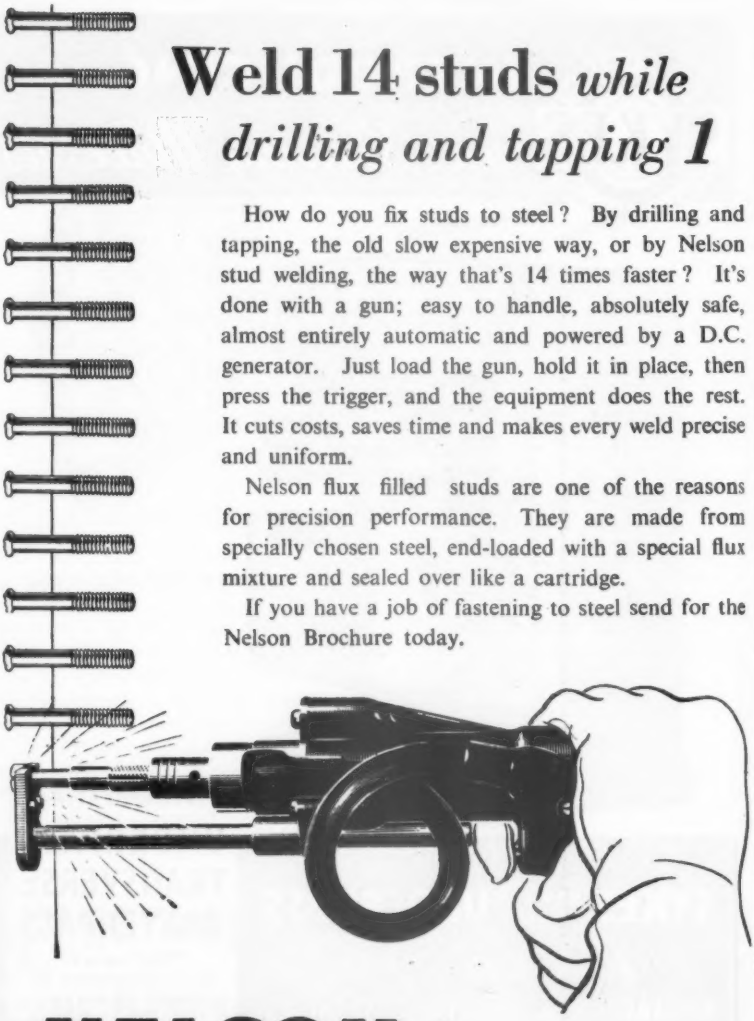
Weld 14 studs *while drilling and tapping* 1

How do you fix studs to steel? By drilling and tapping, the old slow expensive way, or by Nelson stud welding, the way that's 14 times faster? It's done with a gun; easy to handle, absolutely safe, almost entirely automatic and powered by a D.C. generator. Just load the gun, hold it in place, then press the trigger, and the equipment does the rest. It cuts costs, saves time and makes every weld precise and uniform.

Nelson flux filled studs are one of the reasons for precision performance. They are made from specially chosen steel, end-loaded with a special flux mixture and sealed over like a cartridge.

If you have a job of fastening to steel send for the Nelson Brochure today.



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CROMPTON PARKINSON LTD., PLANT DIV.
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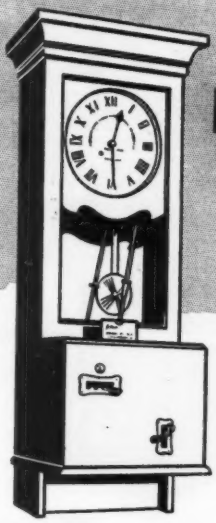

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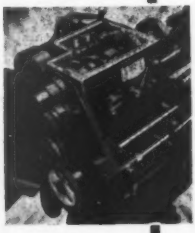
7" CENTRE LATHE

The NEW W & M 70 Junior is a robust 7" centre lathe suitable for production or for general machine shop service. Worthy of a place in any machine shop where economy of operation, accuracy and reliability are primary considerations. Complete specification on request. Merchants supplied.

Shows saddle and tailstock details. Note liberal bed engagement



Head stock and feed box with covers removed to show general arrangement.

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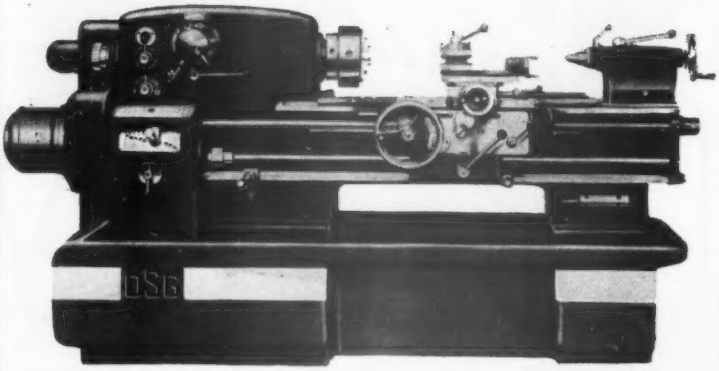

13" SWING PRECISION LATHE.

from our New Range 13" to 30" Swing

Flanged Vee Rope Motor Drive
Self-Adjusting Clutch
Middle Bearing to Spindle
Final Drive to Spindle by Vee Ropes
Patent "Fastlock" Spindle Nose
Wide Range of 12 Spindle Speeds
Wide Range of Threads

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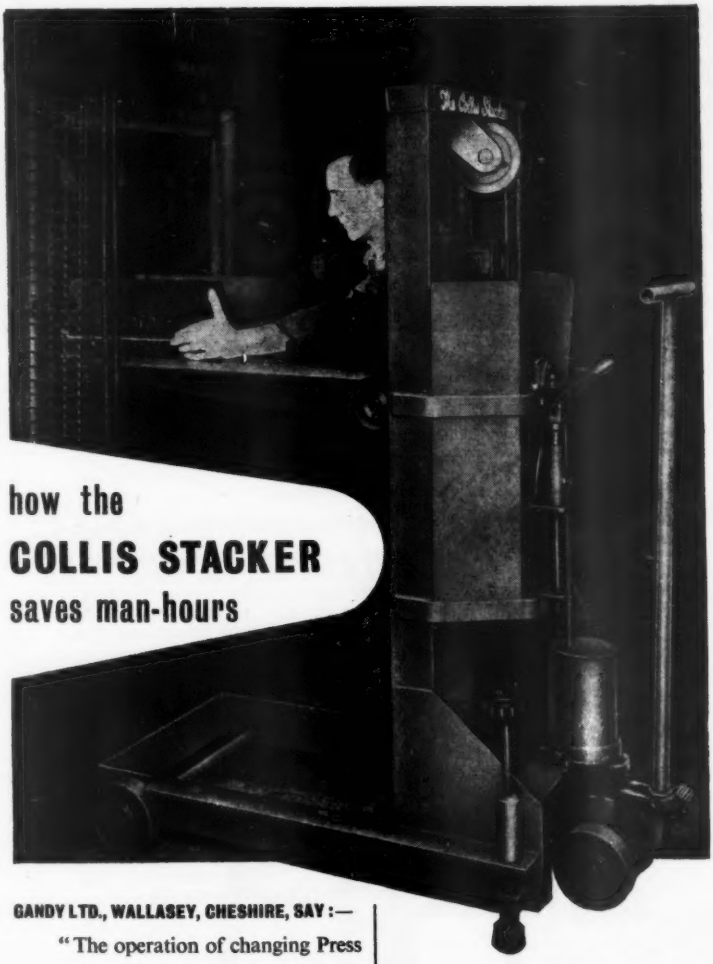
THE LATHE PEOPLE
KEIGHLEY ENGLAND



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GANDY LTD., WALLASEY, CHESHIRE, SAY :—

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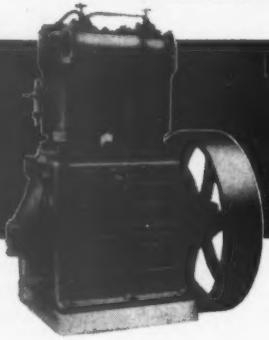
ΦH14

THIS IS WHY YOU SHOULD USE "BROOMWADE"

"BROOMWADE"
COMPRESSOR'S
30 years
FAITHFUL SERVICE



Ever reckon the life of an Air Compressor? Read what Messrs. T. W. Greenwell & Company Limited, the well known Dock Owners of Sunderland, have to say about their two "BROOMWADE" Compressors installed in 1916 and 1919.

The following are extracts from their letter to us dated October 27th, 1949:—

.....on the 18th November, 1942, we wrote to you expressing our appreciation of the extraordinarily good service given to us by the two above Air Compressors which, installed in 1916 and 1919, were the first we ever had in operation.

They were still functioning as well as ever last year, but, as wear and tear was necessitating the renewal of the pistons and/or cylinders,..... we reluctantly scrapped these faithful servants.

Needless to say, the two new Compressors we have installed to take their place are of your manufacture, though of a slightly larger capacity. So far, both these new two-cylinder, four hundred cubic feet compressors are functioning admirably.

You may confidently look forward to a further order from us for two new Air Compressors of the same capacity – in about another thirty to thirty-five years!

"BROOMWADE"

Air Compressors & Pneumatic Tools
MADE FOR HARD WORK

Illustrated is a type E.H. 2 cylinder Compressor as supplied to Messrs. T. W. Greenwell in 1949.

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MAKES TAP WRENCHES OBSOLETE

Hardened and ground spindle is square with table so that all tapping is at right angles. No more drunken threads or broken taps. A novice is bound to get GOOD tapped holes. Spindle reaches down between any projections and saves tap extensions.

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TABLE 16 in. × 20 in.

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THROAT 8$\frac{3}{4}$ in.

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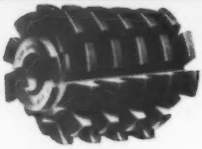

HOBS & FORM CUTTERS

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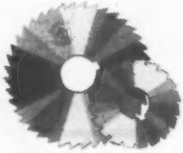
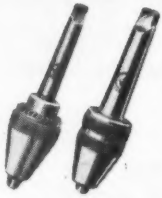
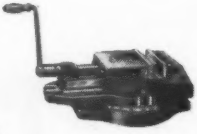


SAWS



DRILL CHUCKS

OIL & SUDS PUMPS



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HIGH SPEED STEEL MILLING CUTTERS INCLUDING SIDE & FACE CUTTERS, FACING CUTTERS, SHELL END MILLS, ANGLE CUTTERS, HOLLOW MILLS, GEAR CUTTERS, END MILLING CUTTERS, HOBS & FORM CUTTERS · REAMERS — SOLID & ADJUSTABLE · TWIST DRILLS COUNTERBORES, JIGS & FIXTURES

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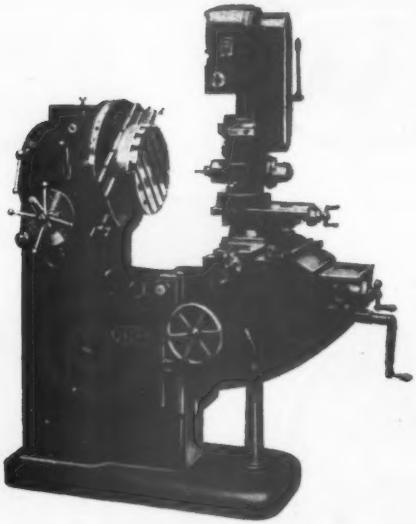

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A new Universal Milling Machine for the accurate production of dies, press tools, punches, and other precision work.

The movement of the slides in relation to the cutter spindle enables rapid machining with standard cutters to be done without the use of templates or formers.

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Inspection is an essential part of production. It is just as important to provide efficient methods and equipment in the inspection department as it is in the machine shop.

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This Precimax Grinder, type HMP13 with 10in. swing and admitting 120in. between centres deals with a wide variety of highly accurate machine tool work at C.V.A. Jigs, Moulds and Tools Ltd., Hove, Sussex. We show it engaged on a boring bar, 7ft. 6in. long by 3½ in. dia. Limits are within 0.0009in. over the entire length.

Whatever your requirements in high precision cylindrical grinding there is a PRECIMAX machine to meet your needs. Get in touch with us.

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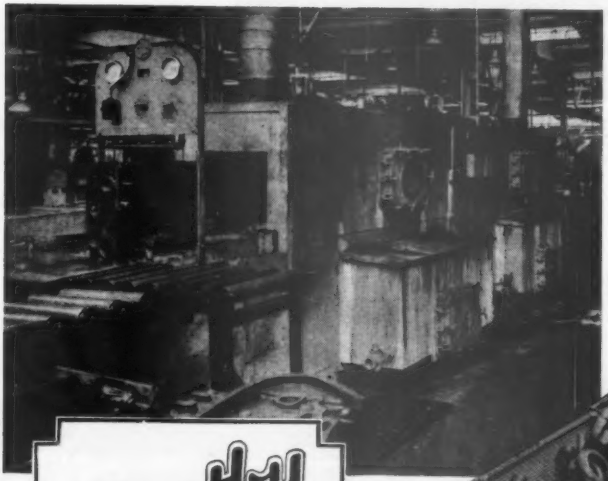

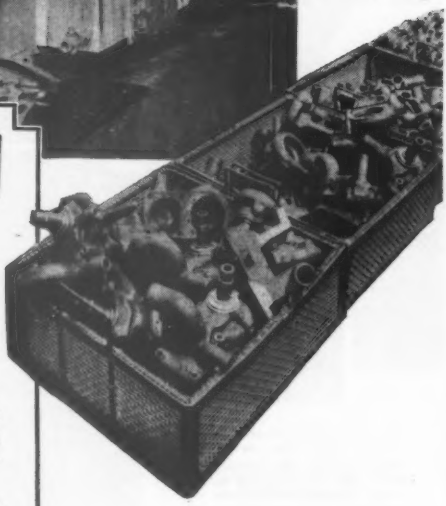

Bratby

INDUSTRIAL CLEANING MACHINES

This illustration shows a machine cleaning crank cases in the production line.

It is equally capable of cleaning small parts in baskets.

Photographs by courtesy of "Machinery"

Sole Agents for Great Britain :

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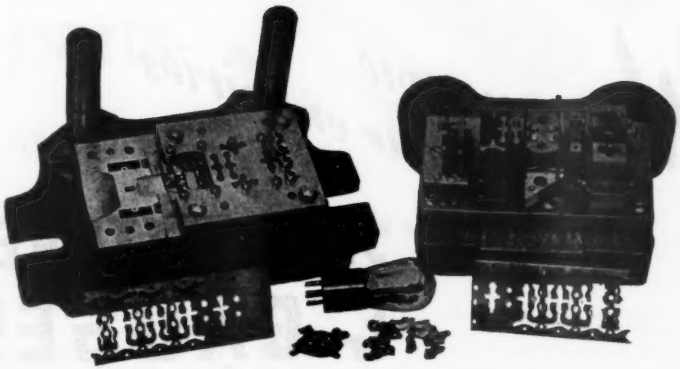

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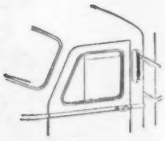
Perhaps we're biased

but to us

these parts

are greater

than



this whole

THE MODERN knights-errant who thunder down the Great North Road put their faith in the perfect working of these zinc alloy die castings, for they are components of the traffic indicator of a lorry.*

Why the parts are zinc alloy die cast

The two halves of the trafficator casing have overlapping lugs to ensure accurate mating, the thin section is strengthened by ribs. In the plastic arm, the checkering of the die cast insert — which acts as fulcrum and stiffener — provides a key between metal and plastic. When the casting has been moulded into the arm, the cored pivot hole is made accurate to within 0.0005 in. The die cast headpiece on the mild steel plunger is a fine example of a zinc alloy attachment.

Equipment for cars too

Modern car components generally made — in whole or in part — by zinc alloy die casting, include stressed parts in the chassis (such as shock absorber bodies), bumper parts, carburettors, petrol pumps, radiator grilles, electrical fittings, number plates, car radio parts and door hardware.

Some facts about zinc alloy die casting

Speed is the essence of the die casting process — the shortest distance between raw material and finished product. Zinc alloys are the most widely used metals for die casting because they ensure :

STRENGTH: Good mechanical properties for stressed components.

ACCURACY: Castings can be made practically to finished dimensions and need little or no machining.

STABILITY: Close tolerances are maintained throughout the life of the casting.

Hence the widespread wartime use of zinc alloy die casting for fuses, gun sights, periscopes, tank carburettors, etc.

British Standard 1004

Alloys conforming to B.S. 1004 should be specified where strength, accuracy and stability are essential.

ZADCA

ZINC ALLOY DIE CASTERS ASSOCIATION, LINCOLN HOUSE, TURL STREET, OXFORD. TELEPHONE: OXFORD 48088.

ZINC ALLOY DIE CASTINGS PLAY AN IMPORTANT PART IN THE EXPORT MARKET

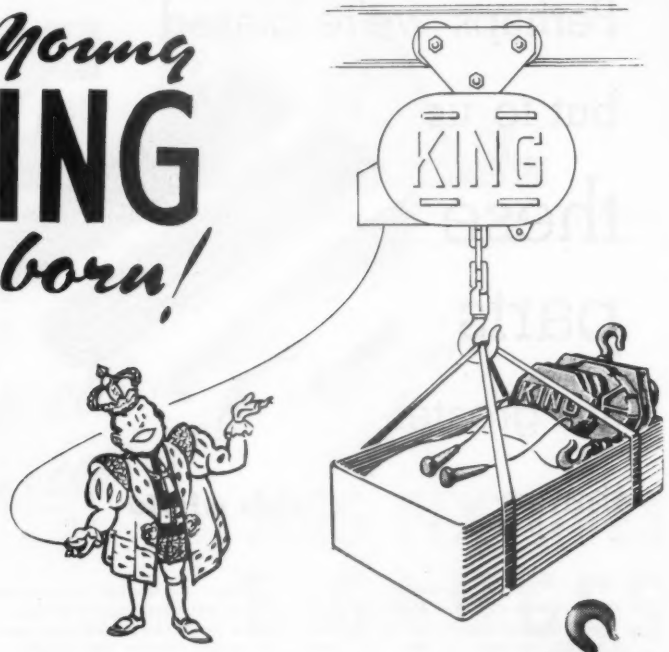
Enquiries about the uses of zinc alloy die castings are welcome. Publications and list of Members will be sent on request.

* Photograph reproduced by courtesy of Joseph Lucas Ltd.

A young

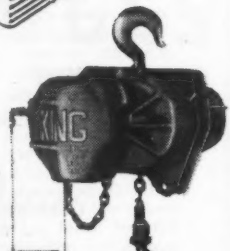
KING

is born!



his name is

MY-TE-MIN



The well known range of KING Electric Chain Pulley Blocks, lifting capacities from 5 cwts. to 10 tons, has now been supplemented by the addition of a highly efficient light capacity model. The "My-Te-Min" Model has a lifting capacity up to 1,200 lbs. The unit is compact, is easily transported and can be used for many handling purposes.

Full details and illustrated leaflet on request

GEO. W. KING LTD.

MAKERS OF ELECTRIC PULLEY BLOCKS, CRANES AND CONVEYORS. WRITE FOR ILLUSTRATED BOOKLETS

P.B.B. WORKS, HITCHIN, HERTS.

If you want Complexity

Picture Post Library

Laocoön found things more complex than he bargained for when he got mixed up with a couple of sea-serpents. But complexity in a die casting is just what the modern manufacturer often needs. And MAZAK lets him have it.

The basis of MAZAK is 'Crown Special' Zinc of 99.99+ % purity, one of the purest metals commercially available. Every batch of MAZAK is spectrographically examined to ensure that close specification limits are maintained.

Thanks to MAZAK'S combination of strength and castability, extremely complex shapes — including thin sections, holes, internal and external threads—can be cast practically to finished dimensions. Examples are carburettors, microscope parts, hydraulic jacks and fuel pumps.

The advantages of MAZAK include suitability for complex shapes and thin sections ; high tensile strength ; high impact strength ; dimensional stability ; durability ; high corrosion-resistance ; ductility ; low finishing cost and ease of plating.

When such qualities are essential to die casting, use or specify MAZAK.

DURABILITY
IMPACT STRENGTH
CASTABILITY

MAZAK

GOOD FINISH
TENSILE STRENGTH
COMPLEXITY

IMPERIAL SMELTING

IMPERIAL SMELTING CORPORATION (SALES) LTD., 37 DOVER ST., LONDON, W.1.

PRODUCTION INCREASED

up to

20%

when you install the

'AIRTRIP'

for safe, instant control of interlocking guards—a standard installation, manufactured by

PRESS GUARDS LTD

and incorporating **MAXAM** Air Valves and Cylinders. Easily fitted, it gives speed and efficiency of working—increased output is assured.

Photograph by courtesy of Standard Telephones and Cables Limited

The "AIRTRIP" can be used on all presses up to 100 tons capacity. Operation is simple and infallible—depression of the pedal closes the guard and at the same time actuates the MAXAM Valve, which passes air to the MAXAM Air Cylinder to engage the clutch. This arrangement frees both hands of the operator and allows much lighter operation of the foot pedal. Also, since there can be no attempt to engage the clutch until the guard is fully closed, failure of the clutch locking gear is completely avoided.

The "AIRTRIP" is designed to comply with H.M. Factory Departments Recommendations. Patents pending.

MAXAM

PNEUMATIC EQUIPMENT

MAXAM Air Control Valves are available for many purposes, and for hand, foot, cam, electrical, mechanical or pressure actuation. MAXAM Air Cylinders range from ¾" to 20" dia. bores x any stroke.

ENQUIRIES FOR 'AIRTRIP'

to Messrs. PRESS GUARDS LTD., 372-8 Farm Street, Hockley, Birmingham.

ENQUIRIES FOR MAXAM

AIR VALVES AND CYLINDERS to the CLIMAX ROCK DRILL & ENGINEERING WORKS LTD., 4 Broad Street Place, London, E.C.2.

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Precision
ELECTRICAL TESTING INSTRUMENTS

The Model 40 Universal
AVOMETER

A multi-range A.C./D.C. Measuring Instrument of B.S. 1st grade accuracy, providing 40 ranges of direct readings on a 5 in. hand-calibrated scale. Range selection is by means of two rotary switches, for A.C. and D.C. respectively. A press-button provides an additional range for each value of current and voltage shown on the switch knobs. The total resistance of the meter is 200,000 ohms. An automatic cut-out provides protection against damage through severe overload.

CURRENT: A.C. and D.C. (0 to 12 amps)
VOLTAGE: A.C. and D.C. (0 to 1200v.
RESISTANCE: Up to 1 megohm.

BRITISH MADE

£17 : 10s.

Size: 8 ins x 7½ ins. x 4½ ins.
Weight: 6¾ lbs. (including leads)
Leather Carrying Case available if required.

Fully descriptive literature available on request.

Sole Proprietors and Manufacturers:

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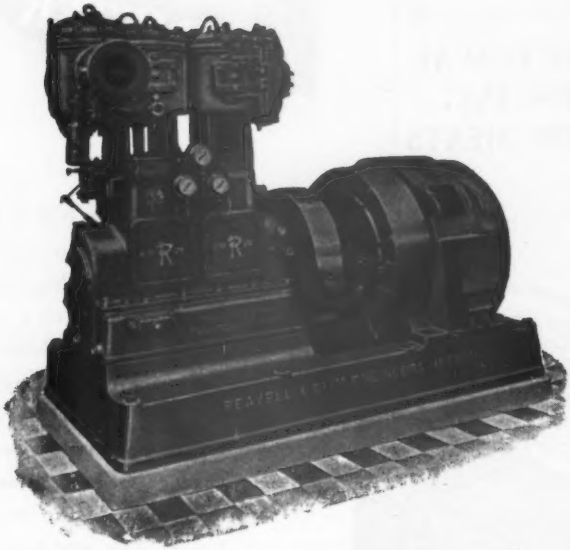

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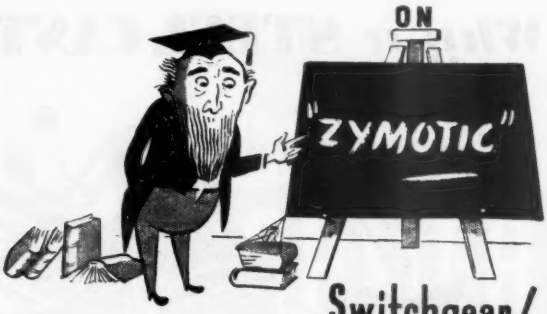

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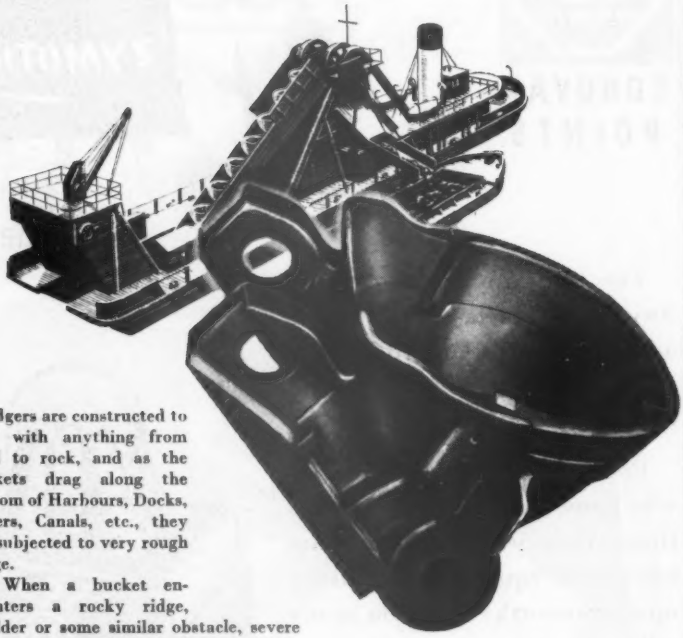

Dredgers are constructed to deal with anything from mud to rock, and as the buckets drag along the bottom of Harbours, Docks, Rivers, Canals, etc., they are subjected to very rough usage.

When a bucket encounters a rocky ridge, boulder or some similar obstacle, severe shock loads are imposed upon it and the bucket lip is subjected to considerable abrasion. The buckets range in size up to, and even above twenty cubic feet capacity and weigh as much as two tons and it is obviously necessary for them to be capable of withstanding considerable stresses as well as the severe shock loads.

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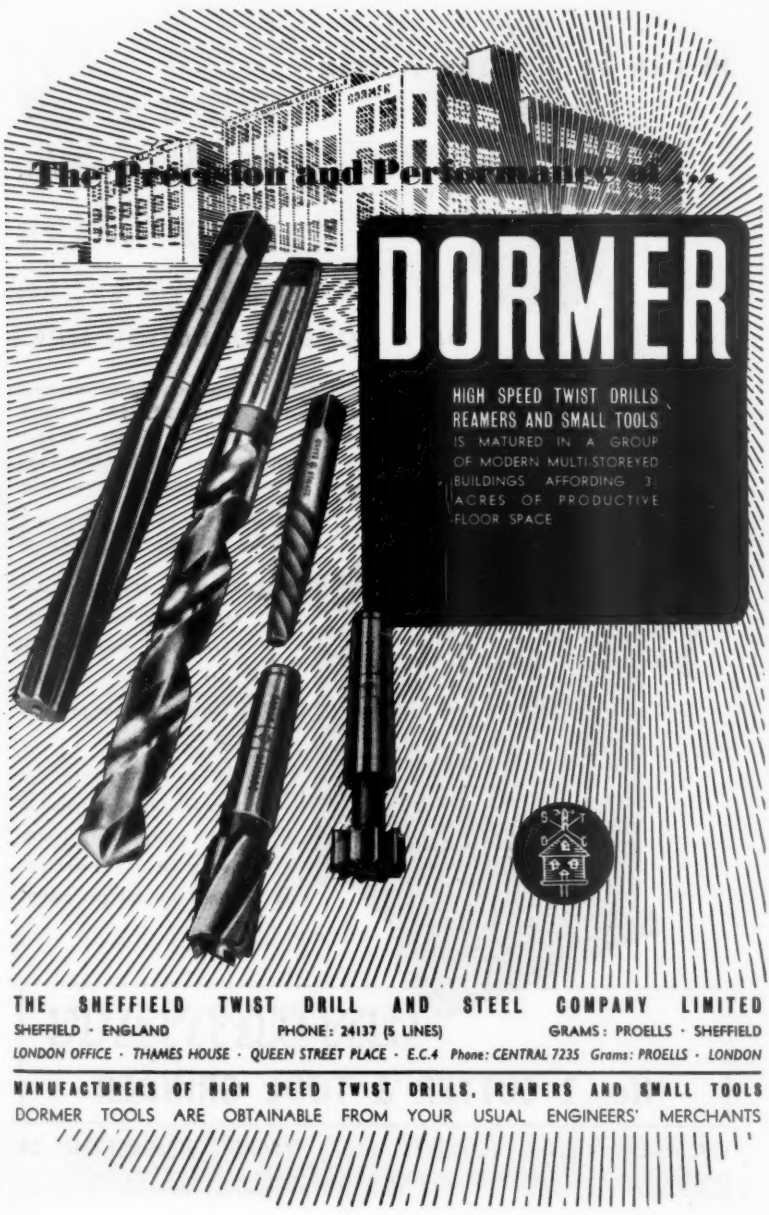

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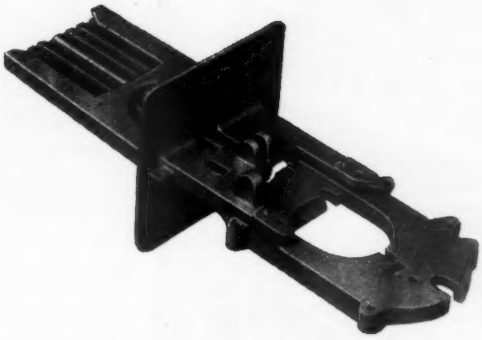

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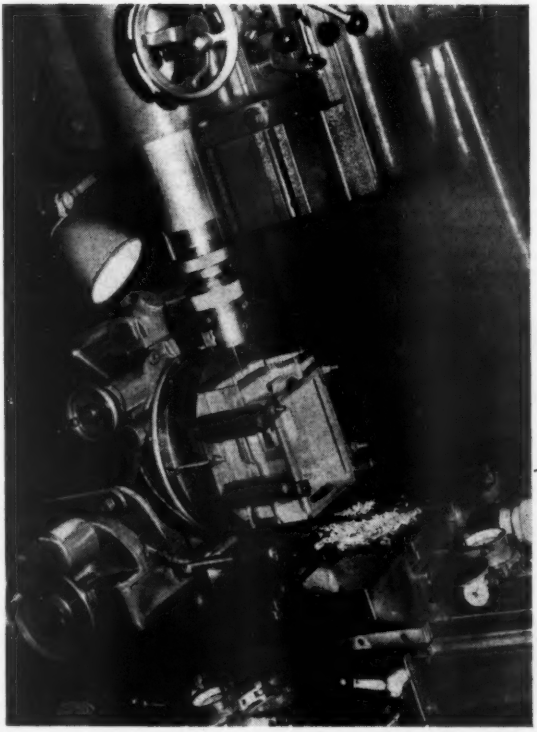

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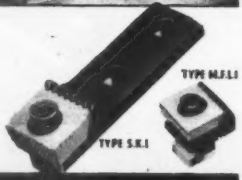

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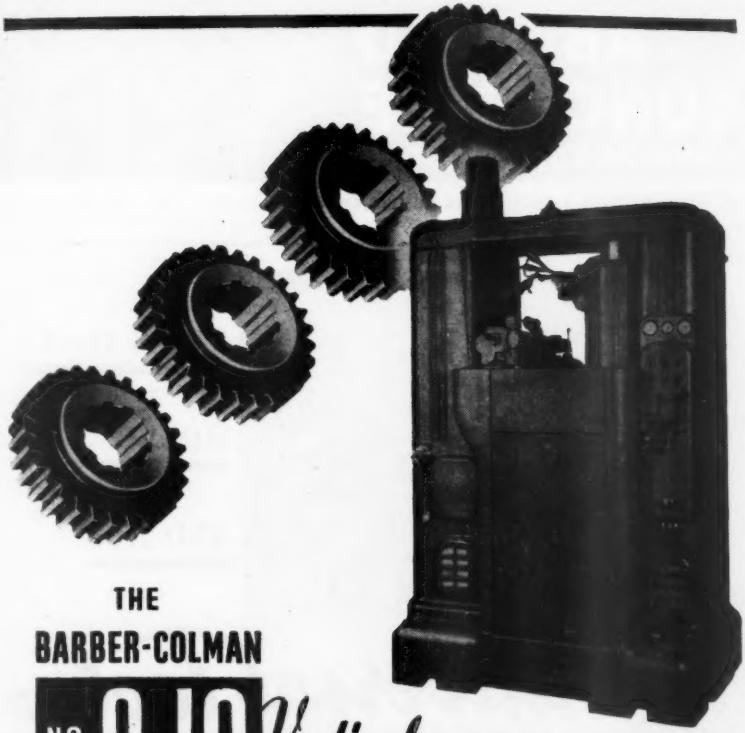

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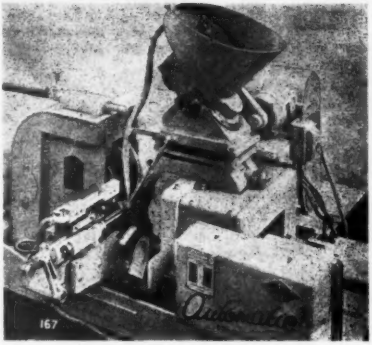

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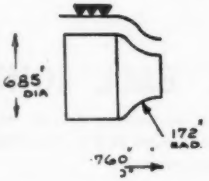

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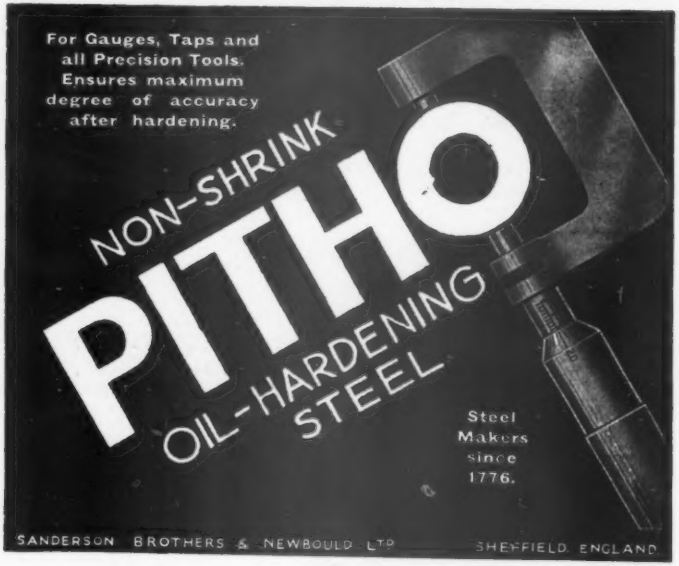
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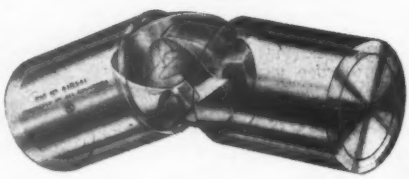

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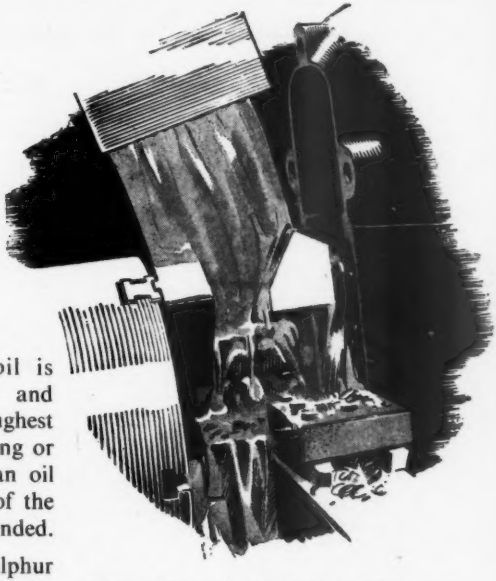

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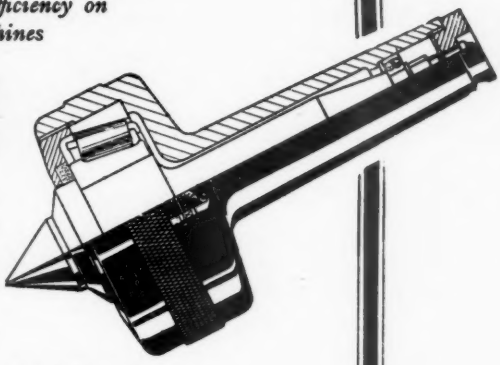

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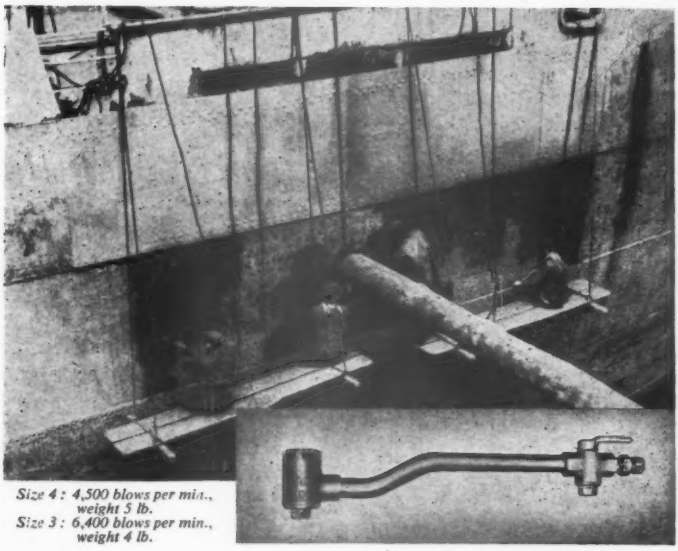

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